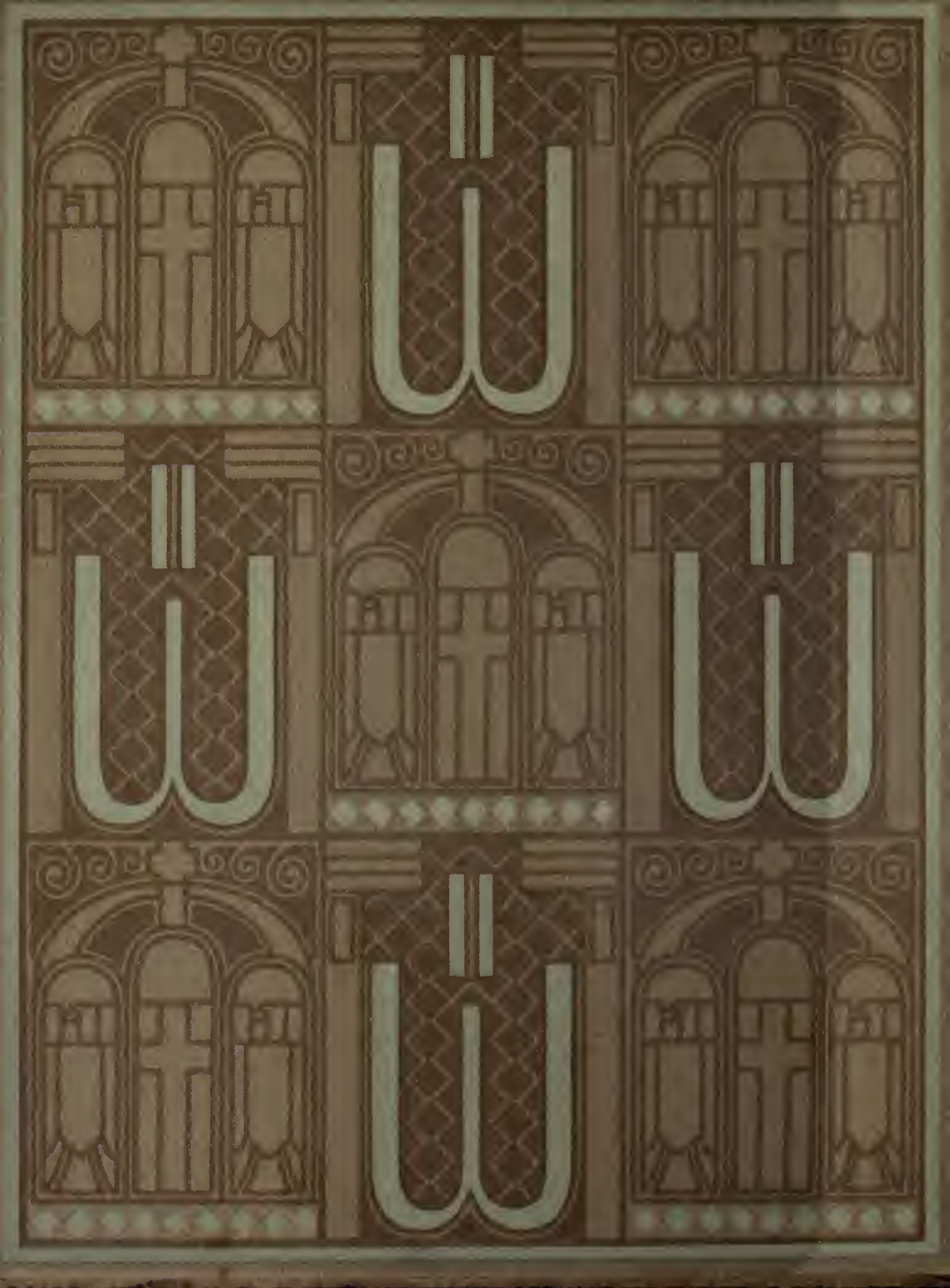
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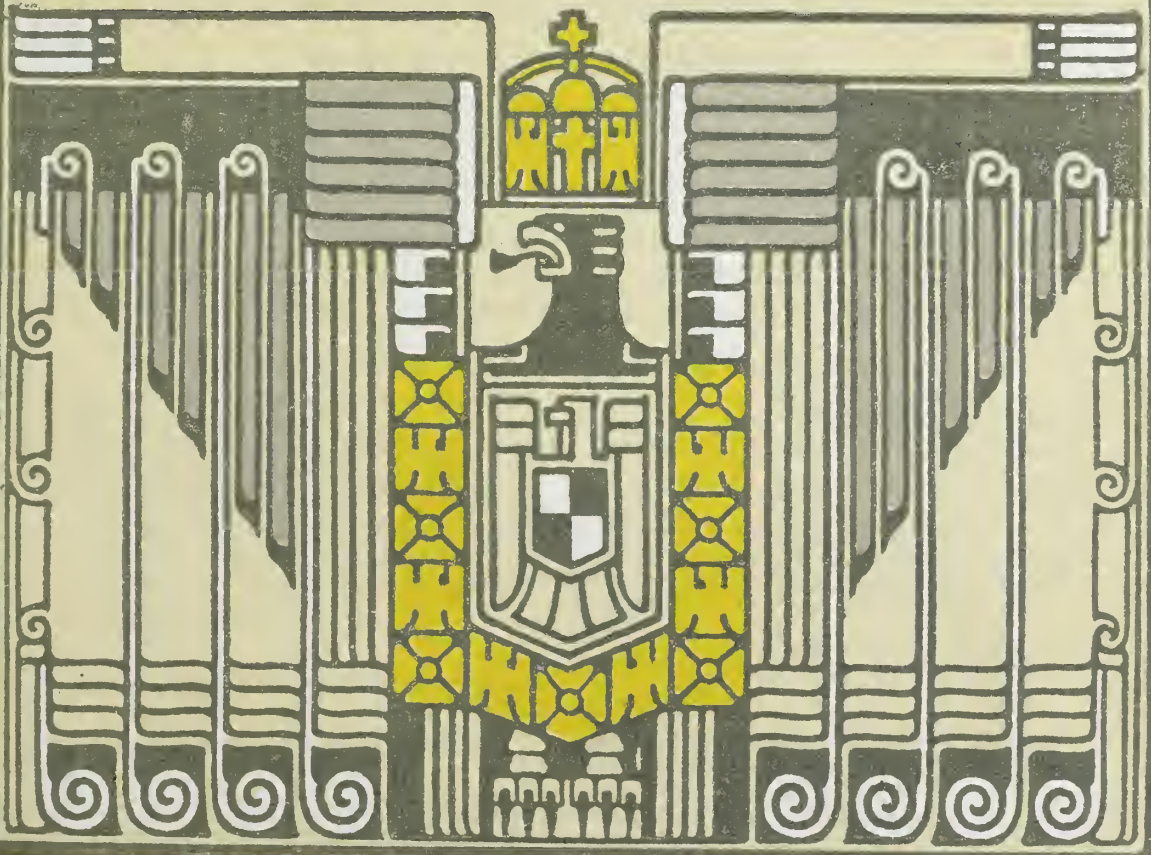
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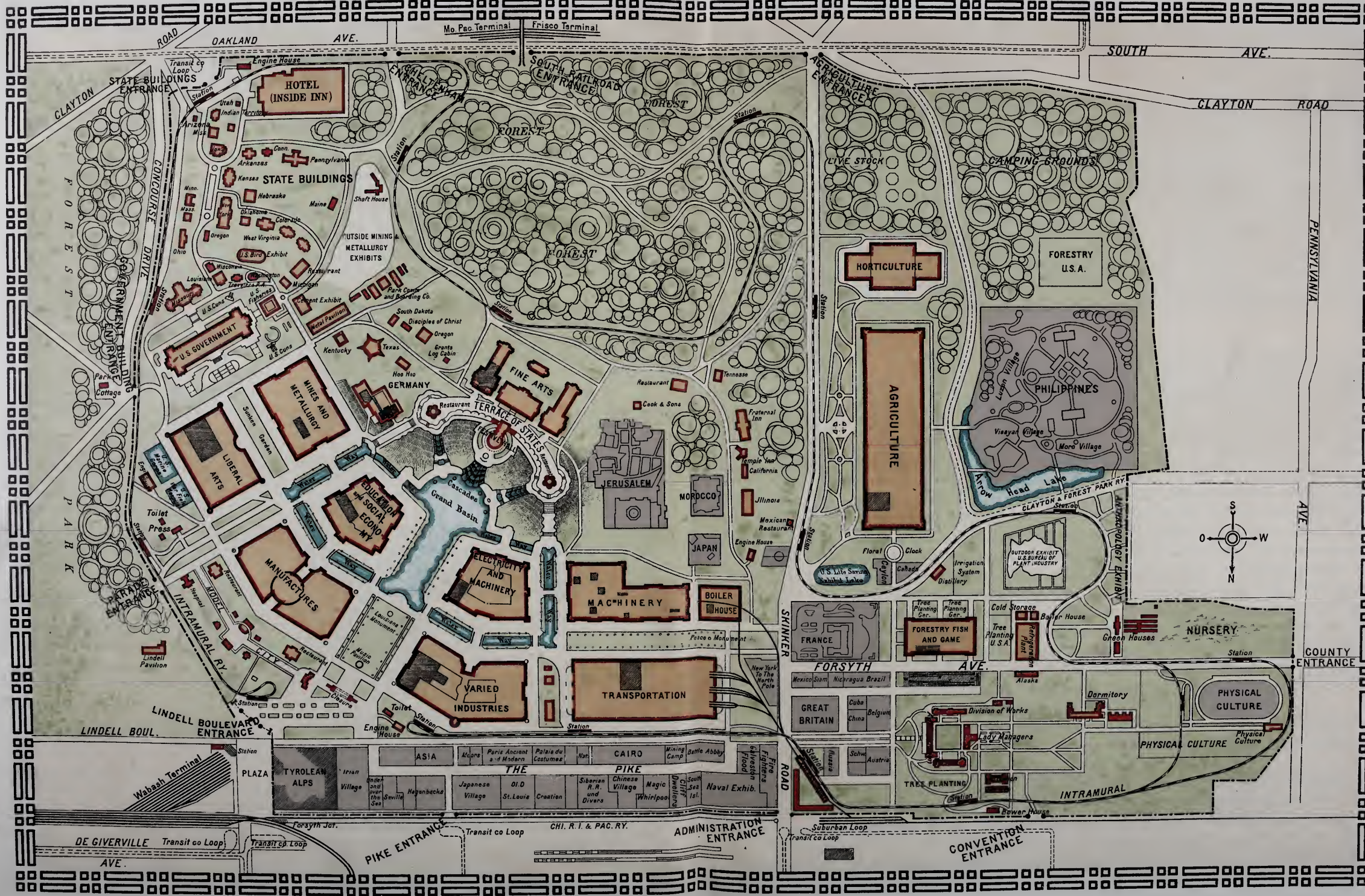
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PIKE ENTRANCE
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CONVENTION ENTRANCE
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N

THE GERMAN EMPIRE AND ITS POPULATION AT THE COMMENCEMENT OF THE XX. CENTURY.

A century and a year have passed since the dissolution of the ancient Holy Roman Empire of the German nation was formally announced at Regensburg on the 25th of February 1803 by the Reichsdeputationshauptschluss. The Holy Roman Empire of Charlemagne, a thousand years old, had led only an imaginary existence during the two preceding centuries. From among the hundreds of its territorial lords, two powers had gradually come to the front. The long period of war after 1793 had resulted in the disappearance of the majority of its petty States. The form adopted at the Vienna Congress in 1815, for the 39 remaining States, the so-called "Deutsche Bund" with a Federal Diet at Frankfort, was, by lack of authority, but little suited for changing Germany into anything more than a "geographical idea."

Economical development on an extensive scale was first rendered possible, by the social-political combination of large territories, which took place on the 1st of January 1834 in the form of the German "Zollverein" (Customs Union). According to Treitschke, even then it took Germany till the end of the fourth decade of the 19th century to regain the height of prosperity she had occupied among the other nations before the outbreak of the Thirty Years War.

Scarcely had a generation passed, when the economical unification was followed by the struggle for a political combination into a uniformly administered State.

A smaller territory, but with an organisation stronger than ever before, the new German Empire, foreshadowed by the "Norddeutsche Bund" (North German Confederation) of 1867, was created on the 18th January 1871. The free will and action of its princes and citizens called into life a Federal State, at the head of which three emperors, William the Great, Frederic III. and William II., have

stood, since its foundation, as the embodiment of the greatness and honour of their country, and as the guardians and preservers of universal peace. The results of these political events have proved blessings to all classes of the nation, and many of the disadvantages caused by the dissension which formerly prevailed were rectified under the new Empire by its first generation of citizens.

I. Territory.

The territory of the German Empire, exclusive of those parts (such as Haffs, Boddens, &c.,) which are covered by water, embraces an area of 540,742·6 sq.-kms which is divided as follows: Prussia 348,658 sq.-kms (64·5 per cent), Bavaria 75,870 sq.-kms (14 per cent), Saxony 14,993 sq.-kms (2·8 per cent), Würtemberg 19,513 sq.-kms (3·6 per cent), Baden 15,081 sq.-kms (2·8 per cent), Alsace-Lorraine 14,513 sq.-kms (2·7 per cent), Mecklenburg-Schwerin 13,127 sq.-kms (2·4 per cent), and the remaining 19 States 38,988 sq.-kms (7·2 per cent).

Colonial Germany beyond the seas, however, covers an area five times as large, viz., 2,656,915 sq.-kms, made up as follows: in Africa: German East Africa 995,000 sq.-kms, The Cameroons 495,000 sq.-kms, Togoland 87,200 sq.-kms, German South West Africa 833,100 sq.-kms, South Seas: German New Guinea 239,000 sq.-kms, the Caroline, Pelew and Marianne Islands 2,176 sq.-kms, the Marshall Islands 415 sq.-kms, Samoa 2,572 sq.-kms; East Asia: Kiao Chao (on lease) 552 sq.-kms, and in addition a sphere of influence 7,650 sq.-kms in extent, embracing 50 kms around Kiao Chao.

II. Population.

Population of to-day.

The population of the Empire according to the census of December 1st, 1900, numbers 56,367,178 persons*). An Estimate made on the strength of the registers of births, deaths, immigration and emigration, returns the numbers for the middle of 1901 at 56·7 millions, 1902 at 57.7 millions, 1903 at 58·5 millions. The numbers contributed by the larger Federal States in 1900 were as follows: Prussia 34·5 millions (61·2 per cent), Bavaria 6·2 millions (11 per cent), Saxony 4·2 millions (7·4 per cent), Würtemberg 2·2 millions (3·9 per cent), Baden 1·9 millions (3·3 per cent), Alsace-Lorraine 1·7 millions (3 per cent), Hesse 1·1 millions (2 per cent), and the remaining 19 States 4·6 millions (8·2 per cent).

Increase of Population.

Since 1816 the population of the area covered by the Empire has developed as follows: at the end of 1816 24·8 millions, 1850 35·4 millions, 1871 41·1 millions,

*) These figures are exclusive of persons on board German ships outside the German Empire, the white population in the German protectorates, and the German expedition in China, in all 97,000 persons.

1890 49·4 millions, 1895 52·3 millions, 1900 56·4 millions. The growth expressed in percentage has been as follows: 1816—1900 total 126·9 per cent, yearly average 0·98 per cent; 1871—1900 total 37·3 per cent, yearly average 1·10 per cent; 1890—1900 total 14·1 per cent, yearly average 1·32 per cent; 1895—1900*) 7·82 per cent, yearly average 1·52 per cent.

The increase in the population shown by the last Census is actually and relatively the largest ever noted for the whole Empire. In certain parts of the country, however, a comparatively larger growth has repeatedly occured. Whilst during the period 1816-1855 the eastern parts of the Empire showed the greatest increase (attaining in Pomerania a maximum of 1·64 per cent, per annum), during the period 1855-1900, it was principally the North Western Industrial neighbourhoods (the towns excluded) which showed a considerable increase in their population, a maximum of 1·65 per cent being reached in Westphalia. In the Southern States the increase in the population has been constantly below the average for the whole Empire (Bavaria 0·64 per cent, Würtemberg 0·51 per cent, Alsace-Lorraine 0·35 per cent). Prussia with 1·10 per cent, stood a little above the average, and the kingdom of Saxony, with 1·51 per cent, considerably above. The relative growth of the population since 1871 in some of the important divisions of the country is shown in the following table:

	Increase per cent 1871-1900		Increase per cent 1890-1900	
	total	yearly average	total	yearly average
Prussia	39·6	1·15	15·1	1·40
City of Berlin	128·6	2·89	19·6	1·78
Ruhr Coal District .	222·8**)	4·12**)	61·2	4·88
Gumbinnen	6·7	0·22	0·7	0·07
Bavaria	27·0	0·83	10·4	0·99
Saxony	64·4	1·73	19·9	1·82
Würtemberg	19·3	0·61	6·6	0·62
Baden	27·8	0·85	12·7	1·20
Alsace-Lorraine	11·0	0·36	7·3	0·69

Density of population.

The density of population, that is to say the number of persons dwelling on every sq.-km of the country's area, has undergone a corresponding change. In the present territory of the whole Empire and of the four kingdoms, the figures are as follows:

*) According to the estimates referred to, the increase for 1900/03 amounted to a yearly average of 1·48.

**) The district of Mülheim (Ruhr), which was not independent in 1871, is not included in these figures.

	Density of population per sq.-km				
	1816	1855	1871	1890	1900
German Empire	45·9	66·8	75·9	91·5	104·2
Prussia	39·3	61·1	70·7	86·0	98·9
Bavaria	47·5	59·4	64·1	73·7	81·4
Saxony	79·6	136·0	170·5	233·6	280·3
Würtemberg	72·3	85·6	93·2	104·4	111·2

The population is strikingly thin in the country districts north of a line drawn between Hanover and Breslau, with the exception of the surroundings of a few great cities such as Berlin, Hamburg, Bremen and Danzig. The districts south of this line are particularly densely inhabited, with the exception of large portions of Bavaria to the east of the Rhine, and the intermediate mountain districts between the Weser, Ems and Main, the Swabian Jura and the Eifel. The population of small villages and towns is most dense in parts of Silesia and the Province of Saxony, in the Kingdom of Saxony and also along the Rhine and its principal tributaries, particularly the middle Neckar, the lower Main and, above all, in Rhenish-Westphalia, all of these districts being decidedly industrial ones. The Baltic Höhenrücken, Mecklenburg, parts of the province of Brandenburg, the heath of Lüneburg, the district of the middle Ems as well as the southern districts already mentioned, are on the contrary very sparsely populated.

Division of the population according to age and sex.

In Germany, on an average, about 106 boys are born to every 100 girls; the mortality however, among the former is so much higher, that they only remain in a majority until they reach the age of 21. Amongst those who attain a greater age, the female sex preponderates in an increasing scale, there being 122 women to every 100 men over 60 years of age. In the year 1900, the total number of men was 27·7 million, the total number of women 28·6 million. Of the total population, 19·6 million (34·8 per cent) were children under 15 years of age, and 10·4 million (18·5 per cent) young people between 15 and 25. In the prime of life, between the ages of 25 and 40, there were 11·9 million persons (21 per cent), and between 40 and 60, 10·1 million (17·9 per cent); of the remaining 4·4 million (7·8 per cent) fully 1 1/2 million (2·7 per cent) had already passed the biblical 70 years, and 269,000 (0.48 per cent) were over 80 years old. 8 men and 32 women could look back on a full century. The men whose age (18 to 45) rendered them liable for military service numbered 11 million. The classification into ages today, shows little variation from the figures noted since 1871. The proportion of children is almost exactly the same, whilst the division comprising children from 15 to 30 years shows a slight increase; the numbers between the ages 30 and 70 have decreased a little, while the numbers of quite old persons have augmented to a considerable extent.

Households. The population of Germany in 1900 comprised 12·3 million households of an average of 4·6 members. Amongst them were 0·9 million households (7·1 per cent of the total) which consisted of a single person, making 1·5 per cent of the population, 2/3 of them being women; 81,000 institutions of various kinds (0·7 per cent of the households) housed 2·9 per cent of the population—the remaining 95·6 per cent of the population were members of family households. In this last category nearly nine tenths belonged to the family, one-fortieth were household servants, and one-twelfth lodgers, boarders, industrial or agricultural servants. A tendency to increase amongst institutions and single households is clearly evident from the statistics since 1871.

Dwellings. The 12 1/4 million households are divided amongst 6·2 million inhabited dwelling houses and 89,000 other buildings. The average number of persons dwelling in each house is 8·9 the maximum (46·6 persons) occuring in Berlin.

The following are the figures for 1900

	Actual number millions	relative percentage
Single	33,520	59·5
Married	19,593	34·8
Widowers	0,809	5·6
Widows	2,353	
Divorced males .	0,031	0·16
Divorced females	0,061	

Approximately 3/5 (58·5 per cent) of persons of marriageable age, (over 18 years on the average—males over 20, females over 16) are married, and a further tenth (9·7 per cent) have been married. These statistics show a slight increase of married persons as compared to previous figures showing the best marriageable age amongst single, widowed or divorced persons.

Movements of the population. The number of marriages contracted in the year 1900 was 476,000, viz. 8·5 per thousand of the population. With this number the average of the Seventies was attained again. After the Franco-German war, the number of marriages increased in 1872 to 10·3 per thousand, but fell in a few years to 7·5 per thousand, after which it rose pretty regularly to the present figure. The birth rate, however, shows a considerable difference; for, reaching its highest point in 1876 with 42·6 per thousand, it continually decreased until in 1900 it fell as low as to 36·8 per thousand, and from an annual average of 40·7 per thousand during the period 1871-1880 to 37·4 per thousand for the period 1891-1900. These figures, however, do not give occasion any anxiety; for in consequence of economic progress and sanitary achievements the rate of mortality has fallen still lower, viz. from 28·8 per thousand during 1871-1880 to 23·5 per thousand during 1891-1900, so that the natural rate of increase in the population has

risen from 11·9 per thousand during the former period to 13·9 per thousand during the latter. In the years 1851-1860 it only amounted to 9 per thousand. This satisfactory philo-progenitiveness of the German race is not evident to the same extent in various districts. The annual average of the natural increase per thousand of the population from 1891-1900 was as follows: Prussia 14·9, (Westphalia 19·8, Posen 19·4, Rheinland 16·5, Berlin 9·7) Bavaria that part on the right bank of the Rhine 10·4, Bavarian Palatinate 16·0, Kingdom of Saxony 15·5, Würtemberg 10·9, Alsace-Lorraine 8·6.

Illegitimacy and still-births. The annual average of illegitimate births occuring during the period 1851-1860 amounted to 11·5 of the total number of births; this percentage, however, dropped to an annual average of 9·1 per cent during 1890-1900. The number of still-born children also decreased to 3·1 per cent, although it had amounted to 4 per cent regularly before 1881.

Denominations. The population of Germany according to the last census comprises 2 large groups of Evangelical Christians numbering 35·2 million persons (62·5 per cent) and a third group of Catholic Christians with 20·3 million (36·1 per cent); other Christian creeds claim 204,000 persons (0·4 per cent). The non-Christian group includes 587,000 Jews (1·0 per cent) and 11,600 persons belonging to other religions. 5,900 persons made no returns as to confession.

III. Nationality, Language and Emigration.

Nationality. There were 779,000 foreigners living in Germany in 1900, a number exceeding 1 1/3 per cent of the actual population. The number of persons born abroad was somewhat greater, and totalled 838,000, so that about 60,000 persons of foreign birth have become German subjects. In 1871 only 207,000 foreigners (1/2 per cent of the population) were noted. Of the foreigners in the census of 1900, 97·2 per cent belonged to European states. Of the remaining 21,500, the large majority (17,800) were citizens of the United States of America, some of them of German origin. Of the European foreigners, 391,000 persons (50 per cent of the total number of foreigners) were subjects of Austro-Hungary, 88,000 (11 per cent) were Dutch, 70,000 (9 per cent) Italian, 55,000 (7 per cent) Swiss, 47,000 (6 per cent) Russian, 27,000 (3·4 per cent) Danes, 20,000 (2·6 per cent) French, 16 000 (2 per cent) British or Irish. The greatest increase amongst these nations since 1880 is shown by the Italians, who have become nearly ten times as numerous, the Dutch 5 times as numerous, and subjects of the Austro-Hungary Monarchy and Russia, 3 times as numerous. The Danes on the other hand have decreased to 3/4 of their number in 1890.

Native language. In the year 1900 the mother tongue of 92 per cent of all inhabitants of the German Empire was German. Nearly 1/2 per cent of the inhabitants had another mother tongue besides German, the principle number (170,000) being Poles.

4 1/2 million inhabitants acknowledged exclusively a non-German mother tongue, amongst them being 3,100,000 Poles, 212,000 French, 142,000 Masourians, 141,000 Danes and Norwegians, 106,000 Lithuanians, 100,000 Cassubians, 93,000 Wends, 80,000 Dutch, 66,000 Italians und 64,000 Moravians. The mother tongue of 22,400 persons was English, 2,200 of which—principally German-Americans—claiming equally German as their mother tongue.

The districts occupied by the Polish-speaking population are principally the provinces of West Prussia, Posen, Silesia; in the Rhenish-Westphalian industrial districts, however, a considerable increase of the Polish-speaking population has resulted from the great influx of Polish miners. In 1880 only 5.9 per cent of the population in the Recklinghausen district were Polish-speaking. In 1900 the percentage had risen to 13.8 per cent. The strong permeation of Alsace-Lorraine—at one time purely French—with the German element is worthy of note, for only 198,000 persons (forming a ninth part of the whole population), still speak exclusively French.

German subjects in foreign countries.

The number of Germans resident abroad, which the international statistics for 1890 returned at 3,500,000, is imcomparably greater than the number of foreigners residing in the German Empire. In the interchange going on between the nations, therefore, the German Empire has hitherto lost considerably. After subtracting the gain resulting from immigration, the 60 years from 1841 to 1900 show a net loss by emigration of 4,790,000 persons, or a sixth of the natural increase in population of the German Empire. The rapid economic growth of the country has, however, resulted in there being a gain of 94,000 persons instead of a loss for the period 1895-1900.

The country which has benefited most from the influx of Germans is the United States of America, where the census for 1890 showed the presence of 2,700,000 inhabitants who were born in Germany. 6,200,000 or 8.2 per cent of the total population of the United States were the offspring of German parents, and 1·6 million were children of parents one of whom was born in Germany. There are no statistics relating to a great number of persons descended in the second generation from parents of German birth. Taking all in all, about one sixth of the population of the United States may be counted as having German blood in its veins. The next most important country, where persons of German birth or German nationality—the difference is not observed in the figures given by the various countries—are to be found, was, according to the statistics for 1890, Switzerland with 94,000; then came France with 84,000, Great Britain and Ireland with 54,000, British Australia with 50,000 and Brazil with 44,000.

German speaking population abroad.

The number of German-speaking persons in all the countries of the world taken together, is very much higher. Estimates recently made put the total number of persons in the world who use German for their every-day speech at 82,000,000 of whom 70,000,000 were in Europe. Of this number 53,000,000 live in the German Empire, 11,000,000—rapidly decreasing in number—in the United States, 9,400,000 in Austria, 2,300,000 in Switzerland, 2,200,000 in Hungary,

2,000,000 in Russia, 600,000 in Central and South America, over 200,000 in Luxemburg, about 100,000 each in France, Belgium, Great Britain, Asia, Africa and Australia, and 50,000 each in Denmark, Holland, Italy and Roumania.

Emigration regarded as a whole.

This distribution of the German race over the whole earth, and its grouping together in special countries is—apart from territories bordering immediately upon the present German Empire—essentially the result of the continuous movement which has made itself evident amongst Germans during the last few generations, particularly in the form of emigration to over-sea countries.

No statistics can be given concerning the emigration over the frontiers of the Empire; regarding the emigration of Germans to lands beyond the seas, the Imperial statistics return the number at 2,560,000 persons for the period 1871-1902. The total number of German emigrants to lands beyond the seas for the period 1820-1903 is estimated at 6,500,000, and the resulting loss of population at over 20 million.

Development and present condition of emigration to countries beyond the seas.

According to the statistics of the Washington Immigration Office, over 5,000,000 Germans emigrated to the United States between 1821 and 1902; during the period 1871-1903 the United States was the goal of 2,500,000 Germans, or 95 per cent of the total number of German emigrants, while all the rest of America only received about 100,000 Germans during the same period. The attempts made to induce German peasants to go to Brazil have had no success worthy of mention. The number of emigrants to that country rose, temporarly only, to 4,000 in 1890, but since 1896 not more than 1,000 per annum has been recorded. It is only due to the sudden decrease in German emigration as a whole, which commenced in 1894, that the figures for the proportion claimed by Brazil, Canada, Africa, &c., appear comparatively higher.

At the beginning of the eighties the annual number of emigrants amounted to over 200,000 persons,—from 4 1/2 to 5 per thousand of the population. In 1891 the number was 120,000, in 1901 only 22,000, in 1902 32,000. Of these 29,211 went to the United States, 807 to Brazil, 546 to other parts of America, 114 to Africa, 2 to Asia, and 235 to Australia. It must be pointed out here that, as a rule, only steerage passengers are counted as emigrants. If cabin-passengers were included in the number of emigrants, the figures would be very different, especially those for Asia, Africa and Australia.

Passengers from German ports.

Four-fifths of the emigrants from Germany start from Bremen and Hamburg, the remainder principally from Antwerp and Rotterdam. Besides the German emigrants there are a large number of foreign emigrants—in 1902 221,000 in all, including 75,000 Austrians, 73,000 Russians and 69,000 Hungarians—who make their way to German ports in order to cross the ocean on German vessels.

Age and Sex of emigrants.

German emigrants in the year 1902 were divided according to age and sex as follows: fully two-fifths were females, and two-thirds of the total number of

emigrants were between the ages of 17 and 50. Of every 100,000 males between the ages of 21 and 30, 400 to 500 emigrated annually between 1871 and 1893, and over 300 in every 100,000 females between the same ages accompanied them. The proportion of emigrants of both sexes between these ages has, however, dropped to about 120 at the present day.

Emigration and movement of population within the country.

It is a characteristic feature of emigration from Germany that not the lowest but rather the better classes leave the country. Emigration is too expensive a matter for the very lowest classes on the one hand, and on the other it is never taken into serious consideration by them. This class of the population is influenced much more by the other great movement which has lately fundamentally altered the distribution of population in the German Empire, viz. the movement of the population within the Empire itself from one part to another, and from the country to the cities, whereby a great tendency to move from the East to the West has made itself evident.

Migration in the East, West and South of the Empire.

The effects of migration are clearly shown by the birth statistics of 1900. If foreigners are not taken into account at all, and only the 55·5 million natives of Germany considered, we find that the following districts in East Germany have gained through inland migration;—Brandenburg (including Berlin), Hamburg and Schleswig-Holstein (including Lübeck), 1·3 million inhabitants; in West Germany,—Bremen, Rheinland, Westphalia and the Kingdom of Saxony 0·9 million; in South Germany,—Baden and Alsace-Lorraine 0·2 million. The following districts have lost,—in the East—East and West Prussia, Posen, Silesia and both Mecklenburgs 1·7 million; in the West—the Province of Saxony with Brunswick and Anhalt, Thuringia, Hanover (with Lippe), Oldenburg, Hesse-Nassau (with Waldeck), 0·4 million. In the South—Bavaria, Würtemberg (with Hohenzollern), and Hesse, 0·2 million.

Figures showing the distribution of gains and losses in reference to inland migration are given below:

Districts which gained in the—	Received (in thousands) from the			
	East	West	South	total
East	976	284	24	1,285
West	463	395	10	868
South.	23	66	97	186
Districts which lost in the—	**passed over (in thousands) to the**			
	East	West	South	total
East	976	703	40	1,719
West	44	395	(gain) 48	392
South.	7	124	97	228

Migration within the country has, therefore, brought a gain of about half a million inhabitants to West Germany, principally from the east. Within East Germany, however, there is also a preponderating movement towards the west; for the districts which are gaining here are in the west, and those losing are in the east. The conditions in South and West Germany are almost the same. In view of these facts, the above figures give a statistical picture of the "westward movement."

The migration within the country, already shown in figures, partially explains the unusual increase in the population and comparative density found in these German States and districts which are more strongly developed industrially as compared with the markedly agricultural districts.

Influence of migration and natural increase upon the actual growth of the population.

The fact that the increase in the population has been below the average of the Empire in East Prussia and Posen since 1870, is principally due to losses caused by migration; in Bavaria, Würtemberg and Alsace-Lorraine, however, which are likewise loosing through interchange of population, the natural increase is a relatively small one. Hamburg and Berlin draw their growing population principally from abroad, while the growth in the kingdom of Saxony as well as Rhineland and Westphalia, is to a large extent due to natural philo-progenitiveness. Since 1890 the situation has altered in so far that the excess of births over deaths has increased everywhere, with the exception of Würtemberg and Berlin, whilst emigration to foreign countries has considerably decreased, in fact has been replaced since 1895, as already pointed out, by a slight gain. Accordingly Alsace-Lorraine, where the losses were due principally to emigration abroad (France), shows a considerably smaller loss. The increased movement towards the west is manifested in Rhineland and Westphalia, where the numbers gained through migration have been doubled; similarly, the greatest loss is shown in East Prussia. The influx into Berlin and Hamburg has fallen off by a half.

The unusually high gains in population due to migration experienced in the capital of the Empire and in the city State of Hamburg, are a result of the cause already mentioned, viz. the "Influx into towns". This has occasioned a fundamental change during the last generation in the relation between country an town population, as proved by the following figures:

	Country population (in places of less than 2,000 inhabitants)		Town population (in places of more than 2,000 inhabitants)		Number of places having over 2,000 inhabitants
	actual (in thousands)	percentage of total population	actual (in thousands)	percentage of total population	
1871	26,219	63·9	14,791	36·1	2,328
1880	26,514	58·6	18,721	41·4	2,707
1890	26,185	53·0	23,243	47·0	2,891
1900	25,734	45·7	30,633	54·3	3,360

so that whilst in 1871 nearly 67 per cent of the population of the German Empire lived in the rural districts, and 33 per cent in towns, today only 46 per cent live in the country, and 54 per cent in town communities. The actual loss of the rural population during the period 1871-1900 was half a million, whilst the towns gained almost 16 million, viz. more than the town population numbered altogether in 1871. The town population was divided in 1900 as follows:

	Inhabitants	Number	Population in thousands	Percentage of total population of the Empire
Country towns . . .	2,000- 4,999	2,269	6,816	12·1
Small towns	5,000-19,999	864	7,585	13·4
Middle sized towns	20,000-99,999	194	7,111	12·6
Large towns	100,000 and over	33	9,120	16·2
	Total . . .	3,360	30,633	54·3

Among the large towns there were 14 with over 200,000 inhabitants, 7 with over 300,000, and 5 with over 400,000 inhabitants, viz.: Berlin 1,889,000, Hamburg 706,000, Munich 500,000, Leipsic 456,000, Breslau 423,000, Dresden 396,000, Cologne 373,000, Frankfort-on-the-M. 289,000, Nuremberg 261,000, Hanover 236,000, Magdeburg 230,000, Düsseldorf 214,000, Stettin 211,000, Chemnitz 207,000.

The above figures only give the population inhabiting the actual municipal area. If the large towns are taken together with the suburbs immediately adjoining them within a circle of 10 kms. from the centre of the town, according to a recently tabulated computation for 30 large towns, we arrive at the following figures:

	Total population (in thousands)	Actual number (in suburbs)	Percentage
Greater Berlin	2,534	645	25·5
Hamburg	988	282	28·5
Essen	758	639	84·3
Dresden	634	238	37·6
Leipsic	566	110	19·5
Munich	526	26	5·0
Barmen-Elberfeld	519	220	42·4
Cologne	481	109	22·7
Breslau	475	52	11·0

	Total population (in thousands)	Actual number (in suburbs)	Percentage
Frankfort-on-the-M. . .	437	148	33·8
Hanover	339	104	30·5
Dortmund	338	195	57·7
Nuremberg	337	76	22·5
Düsseldorf	311	97	31·3
Chemnitz	305	98	32·1
Stuttgart	300	124	41·2

If the suburbs are included, the population of large towns in Germany has increased by almost a half. Whilst the number of inhabitants in the municipal area grew between 1871 and 1900 at the rate of 114·6 per cent, the total increase within the 10 km circle, was 141·5 per cent, i. e., the growth within the suburban area, was considerably greater than in the cities themselves.

Amongst the 9·1 million town inhabitants ascertained in 1900, 43·3 per cent were persons born in the towns themselves; in 1900, on the other hand, 1·4 million persons from these towns settled in other places. These large towns, owing to the preponderating influx of able-bodied adults, show a distribution of ages considerably more favourable from the standpoint of economic development than the remaining portions of the Empire.

IV. Classes and Occupation of the Community.

A. Occupation.

Development.

The development of the division of Germany into ranks according to profession or social position has been from the very first most closely connected with the changes and varying aspects of the population, its movements and distribution. At the beginning of the nineteenth century Germany was sparsely inhabited by a population principally devoted to agriculture, and was only in a position to support a comparatively small number of inhabitants. Dieterici, in 1849, puts the agricultural population included in the German customs Union at 7/10ths of the whole, and the non-agricultural population at 3/10ths. At that time Germany raised at home not only sufficient agricultural products (with the exception of cotton), but also exported annually a considerable amount of her surplus produce. Soon, however, a change in the economic conditions of the country made itself evident. Wholesale industry grew to such an

extent that Germany took a leading place among the industrial nations of the world, and the increasing home population consequently consumed a higher proportion of the products of the earth. Industries for producing goods for export sprang up, whereas instead of exporting agricultural produces as formerly, she has now to import them.

Division according to occupation.

The transition from an industrial minority in the population to an industrial majority was completed in the last two decades of the past century, and is reflected in the figures showing the numbers employed in these two divisions of labour in 1882 and 1895. Whilst in 1882 42·5 per cent of the 45 1/4 million inhabitants of the Empire still earned their livelihood by agriculture, 35·5 per cent by industrial pursuits, and 10 per cent by trade and commerce, the proportion of the population living by agriculture fell in 1895 to 35·7 per cent, whilst the manufacturing population rose to 39·1 per cent, and those living by trade and commerce to 11·5 per cent of the whole population. The following are the principal results of the two censuses:

Population divided according to occupation or trade in 1882 and 1895.

	1895		1882		Increase or decrease since 1882	
	1,000 persons	per cent	1,000 persons	per cent	1,000 persons	per cent
I. Agriculture	18,501	35·7	19,225	42·5	— 724	— 3·8
II. Mining, Manufactures and Building	20,253	39·1	16,058	35·5	+4,195	+26·1
III. Commerce and trade	5,967	11·5	4,531	10·0	+1,436	+31·7
IV. Domestic service and paid work of varying nature*) .	887	1·7	938	2·1	— 51	— 5·5
V. Army, civil service and free professions	2,835	5·5	2,223	4·9	+ 612	+27·5
Army and navy, included in the above	737	1·4	542	1·2	+ 194	+35·8
VI. Without occupation or no occupation stated	3,327	6·4	2,246	5·0	+1,081	+48·1
VII. Other occupations or of no occupation	7,490	13·6	5,407	12·0	+1,642	+30·4
Total population . . .	51,770	100·0	45,222	100·0	+6 548	+14·5

The total population therefore has increased by 14·5 per cent; the agricultural population on the other hand has decreased 3·8 per cent, while the number of persons employed in industries has risen 26·1 per cent, and the number of persons in business occupations 31·7 per cent.

*) Persons receiving pay for domestic service (attendants, &c.) and labourers of varying occupation.

The population is divided according to occupation as follows:

	In 1895		In 1882		Increase or decrease	
	thousand persons	percentage	thousand persons	percentage	thousand persons	percentage
Agriculture:						
As their main source of living	8,293	44·8	8,236	42·8	+ 56	+ 0·7
Servants*)	375	2·1	425	2·2	— 50	— 11·8
Family and dependents	9,834	53·1	10,564	55·0	— 730	— 6·9
Mining, Industry and Building:						
As their main source of living	8,281	40·8	6,396	39·8	+ 1,885	+ 29·5
Servants	320	1·6	302	1·9	+ 18	+ 5·8
Family and dependents	11,652	57·6	9,359	58·3	+ 2,293	+ 24·5
Trade and Commerce:						
As their main source of living	2,339	39·2	1,570	34·7	+ 786	+ 48·9
Servants	284	4·8	295	6·5	— 11	— 3·9
Family and dependents	3,344	56·0	2,665	58·8	+ 679	+ 25·5
Other occupations and of no occupations:						
As their main source of living	1,858	26·3**)	1,429	26·4**)	+ 430	+ 30·1
Servants	361	5·1	302	5·5	+ 59	+ 19·6
Family and dependents	2,687	38·2	2,322	43·0	+ 365	+ 15·9
Without occupation and independent	2,143	30·4	1,354	25·1	+ 788	+ 58·2
Total:						
As their main source of living	20,771	40·1	17,632	39·0	+ 3,927	+ 20·7
Servants	1,339	2·6	1,325	2·9	+ 14	+ 1·1
Family and dependents	27,517	53·2	24,911	55·1	+ 2,607	+ 10·5
Without occupation and independent	2,143	4·1	1,354	3·0	+ 788	+ 58·2

Population earning their living.

The above table shows that in 1895, 2/5ths of the population of Germany were earning their living by an occupation or trade. The numbers of domestic servants, which make up another fortieth of the population, are separated from those earning a living by a trade or profession, because their occupation, like that of the house-wife, is entirely devoted to household matters, and consequently counts directly with the household from the private stand-point, but not from the political economist's point of view. There is also a further matter to be taken into account, viz. that, in ascertaining the proportion of the total population which is earning its living, that part of the population—likewise

*) Servants living in the house employed in household duties and not in industrial pursuits.

**) These low figures are explained by the fact that those of no occupation do not come under the heading "Earning their living" but under the separate heading „without occupation."

forming 2/5ths of the whole—which is below the age of 14 or above that of 60, and which is naturally less capable of earning a living, is not reckoned separately. If this is considered, and the numbers are divided into sexes, the following result is obtained:

Persons between the ages of 14 and 60:

	Total number in thousands	Number by thousands	Earning living occupations per cent
Males . . .	15,158	14,141	93·3
Females . .	15,770	4,768	30·2
Total	30,928	18,909	61·2

Of the population of an age able to earn its own living 3/5ths are therefore actively engaged in doing so, that is, 9/10ths of the males and 3/10ths of the females.

Since the year 1882 the proportion of the total population earning its living has risen in all branches of occupation, but principally in trade and commerce, whilst the proportion of domestic servants has fallen. An increase of 800,000 (2/3rds of the total number) is returned in the division "without occupation and independent," a division made up of the most varied elements.*) Taken all in all, those earning a living by an occupation have increased by 1/5th (nearly 4 million), those under "Family" by 1/10th (2 1/2 million) and persons in domestic service by 1 per cent (14,000).

Change of proportion in each occupation.

The falling off in number of those engaged in agriculture or forestry, a decrease amounting to about 700,000 persons, is not so much derived from those actively engaged as from their servants and families. On the contrary, the number of agricultural concerns and the area under cultivation has slightly increased (see below). Improved agricultural science and machinery, in reducing the amount of manual work have made it possible to dispense with a number of agricultural labourers. What has, however, had far more to do with the depopulation of the rural districts—a circumstance to be much regretted, both from the social and economic stand-points—is the greater freedom and higher pay offered in towns and industrial districts. A far more favourable development is shown in the industry of the country as well as in trade and commerce, which have benefited by almost the whole increase in the population, viz. (86 per cent) since 1882. The number of

*) To this class belong persons living on their own means, pensioners and those in receipt of financial support, those attending school, and students not living with their families, inmates of benevolent institutions, alms-houses, infirmaries, asylums, prisons and reformatories, as well as persons having no stated occupation, but all these provided they are not included elsewhere under "Family." The increase is principally from among persons of private means, pensioners, students and school children.

persons gaining their livelihood in industries has increased by 1,900,000, and their families by over 2 1/3 millions; the number of persons in domestic service only increased by 18,000. The numbers of those engaged in trade and commerce shows a growth of nearly 770,000, and their families and dependents of 680,000, while the number of servants decreased by fully 11,000. The relative increase has been similar in the remaining occupations, also the free professions and civil service, household servants and persons of varying occupation, together with those of no occupation. Taking the average of all occupations, those actually employed and earning their living have increased by 18 per cent, their families by half as much, viz., 1/10th, and their servants by 1 per cent. Persons of no occupation—including those who have a slight occupation of secondary importance—have become more than twice as numerous, showing an increase, without servants and families, of nearly 58 per cent.

Female workers.

The proportion of females, who work for their living, as far as has been ascertained up to 1895, is shown by the following table:

Occupations of females.

	1,000 persons		Percentage		Increase or decrease in percentage since 1882
	1895	1882	1895	1882	
Earning a living	5,264	4,259	20·5	18·5	+23·6
Domestic servants . .	1,314	1,282	5·0	5·6	+ 2·5
Families	18,667	16,828	70·8	72·9	+10·9
Without occupation and independent	1,116	702	4·2	3·0	+58·9
Total . . .	26,361	23,071	100·0	100·0	+14·3

This shows that in 1895, 1/5th of all females or, including domestic servants, 1/4th (as compared with 3/5ths = 61 per cent of the males) were actively engaged in an occupation. This means an increase in female labour since 1882 of 23·6 per cent, as against 16 per cent among the males. In 1895, of a total of 18 million females above the age of 14, 29 per cent were earning their living, and a further 7 per cent were employed as domestic servants. These figures are certainly far behind those for the male population of the same age, where as many as 91 per cent are earning their living; nevertheless they show, that the proportion of females earning their own living already amounts to one third of the males.

Amongst the total number, therefore, of persons earning their own living in 1895, the proportion of males to females was 3 to 1, in agricultural pursuits 2 to 1; in the textile industry and clothing trade, however, the number

of females employed was but little behind that of the males, and in trade and commerce, where the males employed stood in the proportion of 4 to 1 to the females, the division "Hotels and refreshment rooms" shows a preponderance of females over males earning their living. Similarly in the division "Domestic service, &c." females are in the majority, whilst the public service and professions are only beginning gradually to become open to them.

So much for the general features which testify to the large and growing output of work by the whole population.

Different classes of occupation.

Colour is lent to the picture by a glance into the volumes of Imperial statistics regarding occupations and professions, as many as 22 main groups of occupations being distinguished. (Statistics of the German Empire. New Edition, vol. III, p. 30.)

In 1895 Agriculture stood at the head with over 2/5ths of all persons actively engaged in deriving their living from the production and sale of produce. Next came the clothing industry (with 8 per cent of those earning their living), then the building industry (with 7 per cent), commerce (with 6·4 per cent), the textile industry (with 5 per cent), the production of articles of food, metal working, carving and wood work, the carrying Trade, mining, smelting and salt works, &c. It must not be forgotten here that these figures are no criterion for the value and relative production of the various branches of industry, nor for their relative importance within the Empire.

Since the census of 1882 the insurance business has shown the greatest increase of persons earning their living (120 per cent); then come the chemical industry (79 per cent), the Hotel and Restaurant business (76 per cent), the polygraphic industry (71 per cent), metal working (63 per cent), quarrying (51 per cent), the paper industry (50 per cent), &c.

Local distribution of occupations.

The geographical distribution of occupations confirms the fact, already suggested by the table of density of the population, that agriculture is the principal source of work and livelihood of the population of Posen, East and West Prussia and Pomerania, and that it still forms the most general occupation of the population in Mecklenburg, Oldenburg, Bavaria, Würtemberg, Hanover, Baden, Alsace-Lorraine and Schleswig-Holstein, whilst in most of the remaining states and districts, industrial occupations predominate. This is particularly true of the Kingdom of Saxony, Westphalia and Rhineland, where more than half of the population depend upon industry for their living. Trade and commerce is most prominent in Sleswick-Holstein, the Kingdom of Saxony, Hesse-Nassau and Rhineland, where 1/7 to 1/8 of the population earn their livelihood thereby, whilst in Würtemberg, West Prussia the number is only 7 per cent.

Comparison of occupations in towns and in the country.

The division of occupations in town and country is still more distinct than in the different districts of the country. The census of 1895 shows the following result:

Place of dwelling of persons earning their livelihood by occupations, and persons of no occupation and of independent persons:

	In the large towns		In other towns		In country	
	1,000 persons	per cent	1,000 persons	per cent	1,000 persons	per cent
Agriculture	45	1·4	1,078	11·8	7,215	62·9
Industry	1,608	49·4	5,708	49·4	2,573	22·4
Trade and Commerce	775	23·8	1,850	14·4	488	4·3
Domestic service and hired labour	141	4·3	367	4·1	65	0·6
Public service	340	10·5	1,170	10·2	256	2·2
Without occupation	344	10·6	1,276	10·1	867	7·6
Total	3,253	100·0	11,449	100·0	11,464	100·0

A half of all those earning their livelihood in towns are employed in industries, 1/7th in trade and commerce (in the larger towns 1/4), and fully 1/10th in the civil service and free professions. In the country the industries are only half, and the civil service and free professions scarcely a quarter as strongly represented as in the towns.

The development in some of the larger towns is particularly striking. The following are prominently industrial: Barmen, where in 1895, 75 per cent of all persons earning a livelihood and in service came under the heading of those occupied in industry, then Crefeld with 67 per cent, Chemnitz with 67 per cent, Elberfeld with 66 per cent, Dortmund with 64 per cent. Nuremberg with 60 per cent, Düsseldorf with 57 per cent, Aix-la-Chapelle with 56 per cent, Brunswick with 54 per cent, Leipsic with 54 per cent, Berlin with 53 per cent, Breslau with 51 per cent, Cologne with 51 per cent, and Dresden with 50 per cent.

The most prominent commercial cities are Hamburg with 37 per cent, Stettin with 30 per cent, Bremen with 29 per cent, Altona with 29 per cent, Frankfort-on-the-Main with 28 per cent, Leipsic with 26 per cent, Magdeburg with 25 per cent, Halle-on-the-Saale with 25 per cent, Cologne with 24 per cent, Berlin with 24 per cent, and Munich with 24 per cent inhabitants earning a living by trade. Attention must here be again drawn to the fact that the economic importance of the out-puts of these cities is quite inadequately expressed by the figures showing the number of persons earning a livelihood in certain callings.

B. Social Divisions.

Social grades in the division of occupation.

The picture of the German population is completed in detail by a glance at its social division. In 1895, of the total 18·9 million persons earning a livelihood who are embraced in the three principal divisions of occupation, industry trade and commerce, 28·9 per cent were their own

masters, 3·3 per cent employees—principally in commercial and technical establishments—and 67·8 per cent artisans. These were divided according to occupation as follows:

	Year	Own masters		Employees		Artisans		Number of employees and artisans to every 100 masters
		1,000 persons	per cent	1,000 persons	per cent	1,000 persons	per cent	
Agriculture	1895	2,569	31·0	96	1·2	5,628	67·9	223
	1882	2,288	27·8	67	0·8	5,882	71·4	260
Mining industries	1895	2,062	24·9	264	3·2	5,956	71·9	302
	1882	2,201	34·4	99	1·6	4,096	64·0	191
Trade and commerce	1895	844	36·1	262	11·2	1,233	52·7	177
	1882	702	44·7	142	9·0	727	46·3	124
Total	1895	5,474	28·9	622	3·3	12,817	67·8	245
	1882	5,191	32·0	307	1·9	10,705	66·1	212

The relatively largest number of persons conducting their own business (36 per cent) is shown under the head of Trade and Commerce, to which the largest number of employees (11 per cent) also belong. Socially, the artisan class is the one most strongly represented in the various industries, comprising as it does 72 per cent of all persons earning a livelihood. It is interesting to note the two diametrically opposed tendencies which have led to a not inconsiderable increase in the number of masters in the item Agriculture, and to a considerable relative decrease in their numbers in industry and trade in favour of subordinates (employees and artisans). The number of employees has risen throughout all the classes.

If those employed in the civil service, the professions, personal household domestics, hired labour of varying sorts, and if attendants and those of no occupation are also taken into consideration—which cannot, however, be done without causing a certain amount of distortion, since the division is socially dependent upon quite other factors than those applying to the three divisions of occupation—the following altered result is obtained:

	Own masters		Employees		Artisans	
	1,000 persons	per-centage	1,000 persons	per-centage	1,000 persons	per-centage
Agriculture, industries, trade and commerce	5,474	28·9	622	3·3	12,817	67·8
Other occupations	460	14·4	196	6·1	2,542	79·5
Total	5,934	26·8	818	3·7	15,358	69·5

Social divisions and wealth.

The value of this tabulation is increased when one looks more carefully into the great social differences among the class of those who carry on their own

business. Including families and relations, the total population for 1895 may then be divided up as follows:

	1,000 persons	Percentage of the population	Percentage of the independent persons
Independent	23,013	44·4	100·0
a. wealthy class . . .	646	1·3	2·8
b. middle class*) . .	15,875	30·7	69·0
c. poorer class	6,492	12·5	28·2
Dependent	28,757	55·6	
Total . . .	51,770	100·0	

Position of the middle class. The middle class embraces one half of the population engaged in agricultural pursuits. On general economic considerations it appears possible as well as desirable to maintain and strengthen it in that direction. It also includes one seventh of the industrially active persons, and three-fourths of those in trade and business.

This latter class, however, is more and more changing its natural basis through the growth of largely capitalized shops and stores in the wholesale and retail trades. The greater part of the poorer class of independent persons really belong to the working class, and is mostly composed of small artisans and home-workers in the textile and clothing industries, whose conditions of existence leave a great deal to be desired.

Social division in various occupations. Independent persons are comparatively most numerous in the clothing and cleaning trades (56 per cent of all persons earning a livelihood and in service), in commerce (48 per cent), in artistic professions (36 per cent), in the hotel and restaurant trade (36 per cent), in the wood trade (32 per cent) and in agriculture (31 per cent); they are most sparsely represented in the chemical industry (10 per cent), in quarrying, brickmaking, &c. (7 per cent), and most poorly of all in the mining and smelting industries (0·5 per cent) where large concerns are the rule. The greatest number of employees are to be found in the assurance business (66 per cent) and railway and traffic concerns

*) The middle class includes those, who, following agricultural pursuits, are possessors of farms of 2—100 hectares, or who, following industrial pursuits, trade or commerce, or having their own establishments in which collectively 2—20 persons are employed. The owners of larger establishments are accordingly relegated to the wealthy, and those of smaller establishments to the poorer class. From the independent class in all other occupations, $^1/_{10}$th is taken for each of the wealthy and poorer classes, while $^8/_{10}$ths go to increase the middle class. At the same time, however, among persons of no stated occupation, only those are reckoned as independent who live upon their private capital, income, or pension.

(16 per cent), the smallest number in agriculture (0·96 per cent) and the hotel and restaurant business (0·49 per cent). The largest number of labourers are found in the mining and smelting industries (95 per cent), in quarrying, brick-making, &c. (91 per cent), in the building trade (81 per cent) in the polygraphic trades (85 per cent), in the metal-working trade (81 per cent), and in the chemical industry (80 per cent); the fewest are found in commerce (40 per cent) and the assurance business (5·8 per cent).

In the majority of occupations and trades, a decrease in the number of masters and an increase in the number of hands took place, this being particularly noticeable in the textile industry, but also to be found in mechanical occupations such as those of potters, smiths, hat-makers, glasiers, brick makers and brewers.

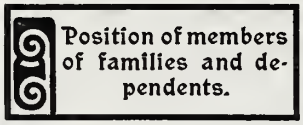
The two sexes are differently divided in the three social classes; that is to say, of every hundred males and females earning a livelihood, we find:

	Own masters		Employees		Labourers	
	Males	Females	Males	Females	Males	Females
Agriculture	40·1	12·6	1·4	0·7	58·5	86·7
Industries	22·8	34·2	3·8	0·6	73·4	65·2
Trade and commerce	36·4	35·0	14·2	2·1	49·4	63·0
Total	31·3	22·0	4·1	0·8	64·5	77·2
As compared to 1882	34·2	25·4	2·4	0·3	63·4	74·3

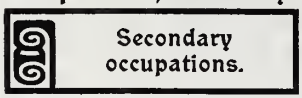
In the labouring class, therefore, there are relatively a far greater number of females earning their living than males, whereas in the employee class there are but few to be found, although many more than formerly. In the industries, a third part of all females earning their living are independent workers (numerous home-workers in the textile and clothing industries being here included). In trade and commerce the proportion is a little higher still, viz., 35 per cent. In this branch of occupation as many 1/50th of all females earning their living belong to the class of employees.

The following figures show the relative position held by females to males in the several social classes in general, and in the particular occupations which they prefer—viz. agriculture, the textile industry, the clothing and cleaning trade, commerce, and the restaurant and refreshment business. Since 1882 the proportion of females in the labouring class has risen by nearly 2 per cent to 29 per cent; the proportion in the employee class fully 2 1/2 per cent, i. e., to over 6 per cent. On the other hand, the relative proportion among the independent workers has remained unaltered at about 20 per cent. In the division restaurant and refreshment rooms, 2/3rds of all persons employed are females; in the textile industry there are as many females as males employed; in the clothing trade and in agricultural occupations the males are only slightly in the majority. The largest number of

independent female workers are found in the clothing trade with 48 per cent; more than 1/4 (26 per cent) of the employees in this branch, as well as in the restaurant and refreshment room business, are females.



A fourth category of persons engaged in occupations, numbering 3·4 million, is that of those who assist in the family of which they are members. The majority of these (2·97 millions) are employed in agricultural occupations, and only 129,000 and 284,000 respectively in industry and trade.



There are many Germans who do not earn their living by one occupation exclusively, but who, besides being engaged in their principal occupation, also earn something in other branches of industry.

Thus in 1895 1/7th of all wage earners,—as against 1/5th in 1882—and 9 per cent of persons with independent means and if no stated occupation, had an occupation of secondary importance; this proportion was made up of about 1/8th of those earning their living principally by agriculture, just 1/5th by industry and about 1/6th by trade and commerce. Almost a third part of the secondary occupation was of an agricultural nature, and 1/10th of all persons earning a livelihood by secondary occupations were women. These figures cannot, however, be actually relied upon except as far as the agricultural occupations are concerned.

The following statistics for 1895 show the ages of those earning their living:

Ages	Number of 1,000 persons earning a livelihood	Percentage of all persons of the given age	Percentage of all persons earning a livelihood
Under 14	181	1·1	0·9
14–20	3,980	62·9	19·2
20–40	9,469	62·0	45·6
40–60	5,460	58·4	26·3
Over 60	1,680	42·2	8·1
Amongst them over 70	417	29·2	2·0
Total . . .	20,771	40·1	100·0

The productive ability of the population from a political economical point of view devolves upon persons between the ages of 14 and 60. Amongst the female population, nearly half, exclusive of domestic servants, were occupied in earning their own living, the preponderating number being between sixteen and twenty years of age; between the ages of 20 and 30, however, the number of females earning their living was only 1/3rd in consequence of marriage; of the domestic servants 593,000 (44·3 per cent) had

not reached the age of 20, a further 519,000 (38·8 per cent) were between the ages of 20 and 30, making in all 1,113,000 (83·1 per cent) under 30, while only 1/6th were over 30.

Child labour. As far as child labour was concerned, it was ascertained that, including those employed in household service, 215,000 children under 14 were engaged in earning their living. Over 3/5ths of these were engaged in agricultural occupations, and about 1/6th in the industry and 1/6th in household service. These must be regarded throughout as minimum figures, for, as experience has shown, the statements made as to the occupations of children are often very faulty.*)

V. Agriculture.

See Special Treatise.

VI. Sea-Fishing.

Modern sea-fishing has been but recently introduced in Germany, and the greater portion of the fish for home consumption is still imported from abroad. Until the eighties, sea-fishing used to be carried on exclusively in the old fashion by sailing vessels. It was not until 1885 that the first steamer was employed for fishing. From 1892–1902 the number of vessels employed in the German sea-fisheries rose from 87, with a displacement of 4,451 tons, to 401 vessels, with 33,255 tons displacement, employing 3,372 men.**) The annual turnover rose in 1897 to over 23 million marks, 2/3rds of which fell to the share of the North Sea fisheries. Since then, the proceeds

*) In order to enable the constantly occuring abuses in the employment of children to be more effectually dealt with than hitherto, a special Act for the protection of children was passed in 1903. The Act was based upon an inquiry instituted in 1898 and not yet completed, which showed that there were in the German Empire at that date no fewer than 532,000 children under 14 years of age engaged in industrial occupations other than factory work; of these 307,000 were employed in various industries (144,000 in the textile industry, 42,000 in the wood industry, 41,000 in the clothing industry and cleaning trade, 28,000 in the production of articles of food and drink), 18,000 in commerce, 3,000 in the transport branch, 22,000 in hotels and restaurants, 136,000 for carrying service, 36,000 for ordinary messenger service, and 12,000 in other occupations. In addition to these there were the children employed in household service and in agricultural occupations for which the figures are lacking, and those engaged in factories. The number of these latter, thanks to the provisions of the new Factory Regulations of 1891, fell considerably as compared with earlier years, and has only slightly increased during the last period of growth. The figures of the Factory Inspection officials are as follows: in 1890 27,485; in 1892 11,212; in 1895 4,327; in 1898 7,072; in 1900 9,249; in 1901 9,454.

**) These figures, taken from the statistics of the Empire, only include fishing vessels of more than 50 cbms (17·65 register-tons) gross tomage. The total number of registered vessels on September 1st 1903 was 753, with a displacement of 43,600 tons and employing 4,963 men.

have considerably risen. The import of fresh fish in 1901 amounted to 27·1 million marks, and the import of salted fish to 5·6 million marks.

The industry consisted until recently of small concerns; of late, however, a number of large concerns with big capitals have developed. Such fishing companies exist on the North Sea at Emden, Geestemuende, Nordenham, Vegesack, Brake and Elsfleth, Hamburg, Altona and Glueckstadt. Herring fishing continues to be carried on partly by means of sailing vessels, but in the deep-sea fishing on the North Sea, steamers are almost exclusively employed.

In 1897 the amount of capital invested in the North Sea fishery was 2–2 1/2 million marks; the amount at the present day is fully ten times as large.

In the Baltic the fishing industry still consists of small concerns, though a great fish market has grown up at Hela, and at Stettin there are large fish-dealers, who with more than 100 boats purchase the fish from the fishermen out at sea and export it.

Besides the springing up of large export businesses, such as the "Nordsee" Co. at Nordenham, the establishment of fishing harbors and fish-markets at Geestemuende, Bremen, Hamburg and Altona (where the turn-over in fish for 1901 amounted in value to nearly 11 million marks) and also at Hela, is of special importance, as is likewise the organisation of the transport by rail.

Numberless concerns have arisen for the preparation and sale of fishing-tackle, and for the realisation of the products and by-products of the industry.

VII. Industry and Commerce.

Industrial undertakings, and persons employed.

The intense development of industrial enterprise within the German Empire corresponds to the large number of its different industrial groups. In the year 1895 more than 3,145,000 industrial undertakings were ascertained to be in existence, and 320 different kinds of industry were classed under 21 different heads.*) These industries employed 10 1/4 million persons, of whom 7,930,000 were men and 2,340,000 women. The industrial nucleus lies in 1,430,000 undertakings with their staff of assistants, employing 8,550,000 or 83 per cent of the total number active in industry. The number of businesses in which only a single person is active (1,710,000) is gradually decreasing. Of the two great groups which can be distinguished in the domain of industrial activity, that of actual manufacture and handicrafts took the foremost place as far back as 1895, with a good two-thirds of all industrial concerns, (68 per cent) and almost four-fifths (78 per cent) of all persons employed in industry. The other division of commerce, transport, lodging and innkeeping, comprised almost one-third

*) There were in addition half a million of secondary undertakings, in which the whole number of persons employed were only incidentally active; these have not been taken into consideration in the above review.

(30 per cent) of all industrial concerns, and one-fifth (21 per cent) of all persons employed; barely one per cent of the total industrial activity is occupied in market gardening, cattle breeding and fishing.

Industrial groups. According to the number of persons employed, the group for the manufacture and cleaning of clothes occupies the first position among the various branches of manufacture, comprising as it does more than 13·5 per cent of all persons employed in industry. Next to it comes the commercial division with 13 per cent, and then follow the building trade with 10·2 per cent, the manufacture of food and articles of consumption with 10 per cent, and the textile industry with 9·7 per cent; a lower percentage of persons employed is shown in the metal working trade with 6·2 per cent, the wood industry with 5·8 per cent, machine and instrument making industries with 5·7 per cent, hotel, lodging and licensed victuallers' occupation with 5·6 per cent, quarrying and brickmaking with 5·4 per cent, and mining, foundries and salt-works with 5·2 per cent. The smallest number of persons industrially active, apart from the non-industrial groups of art and assurance, as well as cattle-breeding, fishing and market-gardening, is to be found in the illuminating material branch, &c. with 0·6 per cent, and in the chemical industry with 1·1 per cent.

If classified according to the number of concerns, the groups form a different arrangement. The group for the manufacture and cleaning of clothes and the commercial division, however, again head the list with 27 and 20 per cent respectively; a long way after these two groups, which almost comprise half of all enterprises, come the others, for the next group, that of the manufacture of food and articles of consumption only comprises 8·6 per cent of all undertakings; it is closely followed by the hotel, lodging and licensed-victuallers' calling with 7·5, the wood industry with 7·0 per cent, the textile industry with 6·5 per cent, the building trade with 6·3 per cent and the metal-working industry with 5·1 per cent of all existing undertakings. Mining, foundries and salt mines with 0·1 per cent, and the manufacture of illuminating materials with 0·2 per cent, occupy the lowest places in the list.

Sizes of the undertakings. The causes for the difference between the number of persons employed and the number of undertakings of the various groups of trades, are due to the vast differences in the average sizes of the undertakings. Whilst in the clothing and clothes-cleaning, cattle-breeding and fishing groups, only an average of 1·6 persons—and in artistic and commercial groups only an average of 2·1 persons fall to one business, other groups which are inclined to develope into large concerns, and in which domestic industry carried on at home plays an unimportant role, show a far greater average; for instance, the paper industry with 8·7 persons, the polygraphic industry with 9·0 persons, the illuminating material industry with 9·4 persons, the chemical industry with 11·1 persons, the stone and earth industry with 11·6 persons, and—far above all other groups—the great mining, foundry and salt mining companies with an average of 130 persons employed.

The tendency towards enlargement on the part of all the different concerns has made itself more or less evident since 1882. In the group for mining, &c. the average number of persons falling to one concern has risen from 81 to 130, in quarrying and brickmaking from 7 to 12, in the textile industry from 3 to 5, and the average in all concerns has risen from 2·4 to 3·3. Only the groups organised on a small scale, such as cattle-breeding, fishery, artistic trades, commercial occupations and the clothing branch, show but little increase in the size of their business.

These figures certainly are only of relative value for industrial classification, as the division into separate concerns does not express the commercial grouping of the same into uniformly managed concerns, that is to say, all branch and separate establishments are included, every separate local works, or workshop belonging to a special branch of industry (see p. 27 Total establishments).

The following table shows the division of commercial concerns according to size:

Small retail, middle sized and large businesses in 1895.

Size	1,000 businesses	Percentage of all businesses	1,000 persons employed	Percentage of all persons employed	Increase or decrease since 1882	
					Businesses	Persons
					percentage	
Small retail businesses (1–5 persons employed)	2,935	93·3	4,771	46·5	1·8	10·0
Middle sized concerns (6–50 persons employed)	191	6·1	2,454	23·9	69·7	76·3
Large businesses (over 50 persons employed)	19	0·6	3,044	29·6	90·0	88·7
Giant businesses (over 1,000 persons employed)	0·26	0·01	449	4·4	100·8	110·5
Total	3,145	100·0	10,269	100·0	4·6	39·9

Of the total number then, of 3 1/7 million concerns, more than 9/10ths (93 per cent) are small retail businesses employing 5 persons or less; these businesses however only give employment to 46 per cent of the 10 1/4 million persons engaged in commerce. The remaining 7 per cent of the concerns absorb 53 per cent of those employed in commerce, whereby the "large businesses" (with over 50 per cent of employees) comprise only 6/10th of the total concerns, but 30 per cent of all persons employed in commercial houses,

i. e., fully 3 million persons. The "Giant concerns," of which there were 255 in 1895, give occupation to nearly 1/2 million employees.

The "middle sized" concerns employing 6-10 persons include 1/17th of all businesses, and 1/4 of all persons employed in commerce. The large concerns belong principally to the industries proper, and the giant concerns almost exclusively so, as they employ over 1/3rd of those engaged in the industries proper; on the other hand, the small retail businesses head the list with 7/10ths of all persons engaged.

In the small retail businesses, one third of those engaged are their own masters, while in the middle sized concerns only 1/3th are masters, and in the larger concerns, only 1·5 out of every 100 persons own a business, whilst 6·7 belong to the staff and 91·8 are workmen. In the industries proper, the difference in the numbers of those having their own businesses and those dependent on them is still more striking.

Home-work industry.

Although now almost everywhere on the decrease, the home-work industry, or work done for another business in the worker's own dwelling, is a feature of certain branches of trade and manufacture. There were as many as 300,000 such small work-shops, in only 70,000 of which any additional assistance was engaged, and they gave employment to 460,000 persons in all, 200,000 of whom were women. More than 4/5ths of these home-workers belonged to the textile industries and to the cleaning and clothing trade, which means that nearly 2/3rds of all concerns in the textile industry (though embracing only 1/5th of all persons employed) are of the nature of home-work concerns. Other branches of industry in which this home-work predominates are the paper-making industry, the wood and saw mill industry and the fine-art trades.

Highest development of largely capitalised businesses.

The highest pitch in the development of modern commercial life has been reached in the so-called universal-provider concerns, i. e. undertakings which, acting under a single directorship and control, embrace a number of various branches of commerce, and more especially in giant private establishments. The combination under one management of the most varied commercial branches in the retail line certainly represents the organisation of incomplete distribution of labour, as, for instance, in the case of small public houses, small retailers and artisans. But in large concerns this massing together of various commercial branches and organisations signifies an acme of concentration both technically and financially effecting a capability of output of the highest order. Whilst in 1895 the 89,000 combines noted did not embrace as many as 3 per cent of all commercial businesses, they now give occupation to no less than 1,700,000 persons, or 1/6th of all persons engaged, in commerce and trade, 1/5th in fact of all persons engaged in the industries. The importance and size of these concerns is still more clearly shown by the table on p. 29 setting forth the driving power employed therein. The greater number of these combines are found in the provision and

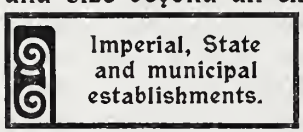
drink trade (27,000); in commercial businesses proper (16,000) and in hotel and refreshment room business (13,000).



The above can be finally supplemented by a consideration of the question of ownership of the 1 1/5 million concerns where assistants are engaged. By far the larger number (1,280,000) were the property of single proprietors, only 5 per cent (70,000) of them belonging in 1895 to associations or to a number of proprietors. What position, however, do these latter occupy in the commercial business of Germany? They include no less than 1/5th of all those engaged in commercial houses where assistants are employed, as many as 2·83 millions. In the diffusion of the industries, where the 40,000 collective undertakings only make 4·6 per cent of all businesses which employ assistants, they embrace 36·8 per cent of all those engaged (2 1/2 million persons); that is, in the chemical industry 65 per cent, in the assurance business 69 per cent, in the illuminating material industry 68 per cent, in mining 5/10ths of all persons engaged. Of these combined undertakings (55,000) 4/5ths are in the hands of companies, working with a total of about 1 1/2 million employees. The remaining 15,000 collective undertakings are companies, co-operative associations, municipal undertakings and the like, with a total staff of over 1 1/5 million persons. Of this number in 1895 3,400 joint-stock companies gave employment to about 800,000 persons in 4,750 establishments.

Besides these heavily capitalized undertakings and 770 limited liability companies, a not unimportant part is played in German commerce by co-operative associations; in 1895 they had passed the first ten thousand, and comprised 2,200 concerns employing 18,000 assistants.

All these figures, however, fail to give a correct idea of the present state of affairs. For during the past 8 years since the last commercial census was taken, combine-concerns and collective undertakings have increased in number and size beyond all expectation.



Among state concerns*), the following belong to the Empire: a number of railway work-shops in Alsace-Lorraine, the Imperial Printing Office, the military work-shops and Imperial shipbuilding yards, making in all 40 establishments. In addition there is the Imperial bank (see p. 70), which takes a middle place between an Imperial and a private concern.

The statistics show a number of 135,000 persons engaged in the 763 various State workshops, &c., mining and smelting ranking first. One-twentieth of all mining operations and one-eighth of the persons employed in the mining industry come within the province of the Exchequer. In the waggon and ship-building industries, and the engine and machine building yards there are 35,000 men engaged.

*) The statistics only show undertakings which are worked on a commercial basis. Amongst others the Postal, Telegraphic and Railway system (see section "Traffic") are not taken into account, with the exception of the workshops belonging to them, as are also street railways. Furthermore, municipal hospitals, slaughter houses, waterworks and public baths are omitted.

In 1895 municipal undertakings were on the increase, though only slightly. By far the greater part of the 1,642 municipal concerns with their 21,000 officials and workmen were employed in the lighting department. In banking and money matters, the municipal savings-banks and pawnshops played a not unimportant part. There were also a number of lucrative municipal institutions and concerns, such as breweries, saw mills, and laundries, working in the interest of the municipal treasury.

Trusts. A recent development of growing importance is the formation of combined undertakings for the purpose of regulating the conditions of supply and demand in certain products. In 1902, apart from the purely local combines, there were about 350 of these cartels or trusts known. The majority have been formed in the chemical industry, the iron industry, in quarries and brickmaking, and the textile industry. Further, the participation of German business men in numerous international trusts (41 in 1897) must also be referred to here.

Machines and machine power. The facts stated as to the division of the population commercially and according to occupation only assume their proper significance, as far as the country's industrial and commercial capabilities are concerned, when the figures are referred to which show the number of machines and engines in the various branches for executing mechanical work. In 1895 there were in all 164,500 concerns (or 4 1/2 per cent of all the concerns in Germany) employing motors with a total force of 3·43 Million h.p.*)

Nearly 4/5ths of this total is produced by steam, and not quite 1/5th by water-power. Other driving means employed are gas, petroleum, compressed air and wind**), which make together only about 2·2 per cent of the whole power. 1/5 of all works employing power (58,000) use steam; nearly as many (54,000) use water, about a ninth part use wind power, and fully 9 per cent use gas.

Work done by power engines. Steam is to be universally found throughout the larger works, water power on the other hand being only used to any considerable extent in smaller works. The total horse-power employed has risen considerably since 1895. The advances made in electro-technology have enabled numerous electric systems for illuminating purposes, driving street cars and factories to be laid down. The use of gas engines of all sizes has also become much more general. The number of stationary and travelling steam engines in Prussia (exclusive of the engines of the army and navy authorities, locomotives and marine engines) increased by 70 per cent from 1895 to 1902. This development being similar in the remaining Federal Staates, the present total of all mechanical power employed for industrial purposes throughout the empire may be estimated at 6 million horse-

*) These figures do not by a long way express the mechanical power employed in Germany. They do not include all the machines employed in the agricultural industry, in non-commercial public works and concerns (such as railways), nor the engines employed in navigation, which in 1895 made a total of at least 8 million h.p.

**) The power converted into electricity is not shown separately in the statistics.

power. If all the other mechanical power employed including locomotives and marine engines be added to this, the estimate must be placed at least at twice that figure, i. e. 12 million horse-power.

The greatest number of engine-driven works are found in the industries connected with the preparation of food and drink, such as corn-grinding, baking, brewing, distilling and beet-sugar making. Nearly half of these concerns (42 per cent) are provided with engine-driven plants. The machine-saws which are so universal in wood-work and joinery make this industry the second in the employment of machinery. Next come railways, navigation, the textile and hardware industries. These five branches of industry include nearly 3/4ths of all machine-driven works. The greatest total of driving power is employed in mining and smelting, viz. 995,000 h. p. or 29 per cent of the whole—averaging 557 h.p. to each plant—although only 1 per cent of all works employing driving power is represented by these branches of industry.

Power engines and size of works.

The division of the mechanical forces employed, according to the dimensions of the various works in 1895, gives the following results:

Works employing	Percentage of all works	Number of 100 persons employed	Number of every 100 h.p. employed
	in each division		
1–5 persons	93·2	45·4	11·5
6–20 „	5·3	14·7	10·5
21–100 „	1·2	15·8	19·3
Over 100 „	0·3	24·1	58·7

The larger concerns employing over 100 persons, though constituting scarcely 1/3rd of the total number of works, employed altogether 1/4th of all persons engaged in such occupations, and 3/5ths of the total engine-power used industrially. It is around them that the industrial output of the nation clusters.

Working machines.

The manner in which the total effective force is employed is best illustrated by details of the machines used. In 1895 the following machines were chiefly in use:

	1,000 machines	Number in small concerns (1,000 machines)
Textile industry:		
Roving and spinning machines . .	10,072	51·3
Silk spinning do.	306	4·1
Jacquard looms } power- {	41	0·1
Other looms } driven {	255	0·9

	1,000 machines	Number in small concerns (1,000 machines)
Jacquard looms } hand {	23	9·7
Other looms } hand {	75	37·5
Carding engines	38	1·5
Other industries:		
Mill runs (Flour making)	114	89·6
Saws (Carving and wood-work)	119	43·6
Circular and endless saws (do.)	43	13·1
Metal-cutting machines	35	0·7
Ovens for bricks and earthenware	28	17·4

As can be seen, the textile industry employs the most machines, though utilising only 15 per cent of the total engine power in use in the industries. The figures showing the number of machines employed in small concerns prove how important a part these small establishments play in certain branches of industry. Nevertheless, the small proportion of power-driven looms employed in small concerns shows clearly the backward state of the technology of the majority of these small establishments.

VIII. Patents.

The protection of inventions and of intellectual property offered by the Patent Acts of 1877 and 1891 had been of no small importance for the rapid growth of German industry. Since, 1877, and up to the end 1902, as many as 139,000 patents were granted and 191,000 "utility models" were protected. These figures are divided as follows:

	Patents granted 1877–1902	Utility models registered 1891–1902
Total	139,092	190,602
Concerning:		
Relating to electric apparatus	6,265	7,487
Metal working (chemical and mechanical)	5,866	4,495
Instruments	5,524	7,478
Railways	5,101	3,038
Domestic utensils	5,073	21,648
Steam boilers and engines	5,009	1,626

	Patents granted 1877–1902	Utility models applied for in 1902
Inventors place of residence:		
Germany	92,189	26,317
Other countries	46,903	1,166

Beside the objects protected by patents and the registration of "utility models," trade-marks were registered, under the Trade-marks Acts of October 1st 1894, on some 57,391 articles in common use, thus characterising them as the goods of certain firms and of a particular quality.

The number of patents granted grows every year, as does also that of the "utility models" registered; the number of trade-marks registered annually is however slowly decreasing.

IX. Industrial activity and production.

Increased productivity of the industries.

The capabilities of German industry have at least kept pace with the increase of mechanical power and the expansion of industrial enterprise. This becomes at once apparent if the results of the commercial and industrial census are compared with the figures showing the products at the present day; in many respects the productive capability of the industries has grown more quickly than the amount of working power employed, and the increase in the number of concerns and amount of capital invested in them. Improvements in technological respects and matters of organisation have allowed a full application in the industries of the law of increasing returns, and the agricultural industry has enabled the nation to work in many places against the contrary law which holds good in agriculture.

The iron mining industry for example, as can be seen from the following summary, has made perfectly astounding progress in respect of productivity. In spite of a considerable decrease in the number of persons engaged, the out-put has risen to half as much again. In the beet-sugar industry an increase of 2/5ths in the number of persons employed has taken place, but the output has been nearly trebled. In the coal mining and brewing industries on the other hand, the number of persons employed and the total amount of products have both increased in the same ratio. It must, however, be added here that the brewing industry in particular has made considerable progress in every direction, a progress which has rather increased the excellence of the products than the lucrativeness of the industry.

The figures for 1895 were:

Productiveness.

	Persons employed in thousands	Bulk produced	Increase or decrease since 1882	
			Persons	Products
			percentage	
Iron mines	20·7	12,350 (1,000 ts)	−31·0	+ 49·5
Beet-sugar manufacture.	95·2	1,167 „	+41·4	+194·6
Coal mines	258·4	79,169 „	+48·6	+ 51·9
Breweries	97·7	55,250 (1,000 hls)	+43·2	+ 41·5

A similar satisfactory state is shown by the mining results which give an idea of the development of the coal and iron industries, the two chief industries and the basis of the entire commercial activity of modern times, during the last decades of the nineteenth century. As shown by the following tables, the following changes took place in regard to number of persons employed and the bulk of products since 1880:

	Increase since 1880		Average production of a workman		Increase in productiveness since 1880
	Persons	Products	1900	1880	
	percentage		tons		percentage
Bituminous coal mines	131	133	262	264	1
Iron mines	22	162	202	433	114
Pig-iron works	64	212	129	245	90
Iron foundries	167	249	14·4	18·8	31
Weld iron works . . .	−25	−25	26·7	26·6	0
Ingot iron works . . .	520	864	32·8	51·0	56

Chief mining statistics for 1880–1902.

Production in 1,000 tons.—Employees in 1,000 men.—Value in 1,000,000 marks.

	1880	1890	1895	1900	1901	1902
Bituminous coal:						
Mines at Work . . .	484	408	319	318	315	308
Employees	178·8	262·5	303·9	413·7	448	451·2
Production.	46,974	70,238	79,169	109,290	108,539	107,474
Value	246	538	539	966	1,015	1,057
Iron ore:						
Mines at Work	831	755	491	575	522	462
Employees	35·8	38·8	33·6	43·8	40·8	39·2
Production.	7,239	11,406	12,350	18,964	16,570	17,964
Value	34	48	41	78	72	66

	1880	1890	1895	1900	1901	1902
Pig-iron:						
Blast furnaces at work	246	222	212	274	263	241
Employees	21·1	24·9	24·1	34·7	32·4	32·4
Production	2,729	4,658	5,465	8,521	7,880	8,530
Value	163	268	237	551	492	456
Cast iron:						
Foundries	1,034	1,148	1,232	1,253	1,249	1,295
Employees	35·7	64	67·9	95·5	85·7	84·5
Production	515	1,027	1,155	1,796	1,513	1,570
Value	95	187	185	349	273	262
Weld iron and Steel:						
Works	335	255	208	174	164	156
Employees	51·2	54	38·2	38·2	31·6	27·5
Production	1,358	1,559	1,077	1,016	823	895
Value	201	234	150	179	123	120
Ingot iron and Steel works:						
Works	53	115	149	189	200	199
Employees	20·1	52·8	75·1	124·7	121·9	126·4
Production	661	2,032	3,962	6,362	6,211	7,422
Value	136	329	413	863	794	848

In addition to these, 1,600,000 tons of zinc, lead and copper ore valued at 60,000,000 marks, and 4,500,000 tons of stone and potash salts valued at 48 million marks were mined. The foundries produced 325,000 tons of zinc, lead and copper, representing a value of 135 million marks. The extraction of salt from solutions was carried on in 1901 in 121 principal and 87 secondary establisments, employing 8,650 hands, and producing 1,121,000 tons at a value of 64,000,000 marks.



Crisis in 1900.

The iron crisis of 1900/1902 interrupted the progressive development for a time (as can be seen from the decrease in the returns of production, value and employees for that period). Owing to the fact that in order to fulfil the coal mining contracts which had been put on one side during the crisis, increased exertions were required after the crisis had passed, the number of employees in the coal mines rose, although the amount produced remained the same.



Statistics of production for 1897.

The statistics for 1897, drawn up at the instigation of the Home Office, give a fair idea of the present state of the entire commercial productions of the German Empire. The products of some of the German industries in the year 1897 were as follows:

	Amount in 1,000 tons	Value in million marks
I. Mining, smelting works and salt works.		
Mining.		
Bituminous coal . . .	90,451	733
Brown coal (lignite) .	26,915	78
Ore	11,938	135
Salts	3,156	39
Blast furnaces (ingot and weld iron Rolling mills).		
Pig-iron, ingots . . .	5,556	443
Partly manufactured	1,654	144
Entirely manufactured	5,062	687
II. Quarrying.		
Stone quarries	—	86
Cement industry . . .	—	74
Glass manufacture .	525	115
Pottery ware	—	114
III. Metal works.		
Foundries	1,584	318
IV. Manufacture of machines, instruments, &c.		
Boiler works of all kinds	—	78
Iron constructions .	—	80
Machines	—	620
Locomotives and locomobiles	—	62
Ships (iron and steel)	—	72
Railway and street car construction . .	—	63
V. Chemical manufactures	8,311	948
VI. Textile manufactures.		
Yarns (partly manufactured)	524	835
Amongst them:		
Cotton yarn	—	315
Flax	—	43
Jute	—	38
Worsted	—	275
Carded	—	259
Chappe	—	2
Yarns (entirely manufactured)	—	74
Woven goods.		
Amongst them:		
Cotton woven goods	—	448
Linen	—	83
Jute	—	46
Cloth, Buckskin, flannel	—	364
Other woollens	—	266
Various woven goods	—	115
Silk woven goods . .	—	195
Curtains	—	13
Worked goods	—	141
Haberdashery	—	104
Embroidery, &c. . . .	—	53
Network manufactures	—	3
VII. Paper industry.		
Wood cutting	769	26
Cellulose manufacture	250	48
Paper and cardboard	778	205
Worked-up paper-industries	—	272
VIII. Indiarubber, gutta percha and celluloid industries	16	79
IX. Leather industry . . .	—	336
X. Articles of food and consumption.		
Manufact. of starch (exclusive of rice starch)	—	46
Tobacco industry . .	—	325

A total summary of these values is difficult because some of the groups appear twice. A part of the value of coal, for instance, appears in the manufactures belonging to other industries. The estimate of the value of these industries varies between a total of 8,100 and 9,250 million marks.

X. Cost of Living.

National wealth and income. The German nation, according to Schmoller, has at its disposal a capital of about 175 to 200 milliard marks (the highest estimates are 250 milliards) which includes a floating capital invested in stocks of about 45 to 50 milliards. The national income amounted, according to the most careful calculations made by May, to 31·2 milliards in 1900, as compared with 25·4 milliards in 1895; on an average there were 550 marks income to every head of the population.

Distribution of income. Persons earning their own livelihood with incomes up to 3,000 marks, and those persons with higher incomes, took the following share in the total national income:

	Single income	Total income		1895	Increase in 1900	
	Marks	Milliard marks	Percentage	Milliard marks	Percentage	
	up to 3,000 . .	22·87	73·4	19·50	17	
	over 3,000 . .	8·30	26·6	5·89	41	
	total	31·17	100·0	25·39	23	

The total national income has therefore increased by a quarter during the last five years, a period however of great growth in trade. Those incomes over 3,000 marks took twice as large a share in this increase as those below that sum. The population increased during the same period by 7·8 per cent.

42 per cent of the total income in 1900 (12·9 milliard marks) belonged to the labouring classes (including servants), which numbered 15·5 millions of all persons earning their own livelihood or 59 per cent.

A more accurate idea of the development and distribution of the national income can be gained from the Prussian tax list for 1902:

The population of Prussia was shown by the returns to amount to 34,550,000 (about 3/5ths of the inhabitants of the whole Empire); of these, 3,760,000 physical (physisch) persons, or 10·9 per cent of the total population, possessed a taxable income exceeding 900 marks (on an average 2,277 marks per person), on which an income tax of 170,200,000 marks (an average of 45·3 marks per person) was levied. In addition there were 2,670 juridical (juristisch) persons possessing a total income of 476,000,000 marks paying an income tax of 18,640,000 million marks—450,000 physical persons having incomes over 3,000 marks, amounting in all to 4,793,000,000 marks. This sum was made up of 1,237,000,000 marks income from capital, 996,000,000 marks from landed property, 1,475,000,000 marks from trade, commerce and mining, and 1,084,000,000 marks from other profitable occupations.

Deductions amounting to 693,000,000 marks were made for interest on debts, permanent charges, and other legal, non-taxable items, so that the group of "Zensiten" referred to only had to pay taxes on 4,100,000,000 marks, which amounted to 121,100,000 marks, or 71·2 per cent of the entire amount raised by taxes from physical (physisch) persons.

The division of the single tax groups was as follows:

Amount of income	Zensits		Amount of tax	
Marks	1,000 persons	Percentage	Million marks	Percentage
900–3,000	3,310	88·0	49·0	28·8
3,001–9,500	369	9·8	42·0	24·7
9,501–100,000	78	2·1	52·7	31·0
Over 100,000	3	0·1	26·5	15·5
Total . . .	3,759	100·0	170·2	100·0

The conditions of income in towns and in the country show a great variation:

		Towns	Country	Total
Total population	1,000 persons	15,031	19,520	34,551
Assessed to pay taxes, including dependents	1,000 persons	6,742	5,485	12,227
do.	percentage	44·9	28·1	35·4
Income assessed	million marks	6,002	2558	8,560
Amount of tax	1,000 marks	128,239	41,955	170,193
Per head of the population	marks	8·53	2·15	4·93

The number of physical (physisch) persons (without dependents) assessed, rose between 1892 and 1902 by 54 per cent, their share in the total population from 8·15 per cent to 10·88 per cent, the amount of taxes at which they were assessed by 48 per cent, whilst the total population only increased to the extent of 15·6 per cent.

Corresponding to the above, the taxation statistics of Saxony, which are also made up of quite small incomes, show an increase in the number of assessable Zensits quite out of proportion to the growth of the entire population in spite of a slight increase (from under 300 to under 400 marks) in those incomes exempt from taxation, and, further, a relatively much larger increase in total income and the amount of taxes, viz.:

		1880	1900	Percentage of increase
Number of inhabitants . .	1,000 persons	2,973	4,202	41·3
Zensits	1,000 persons	1,120	1,746	56·0
Income assessed	million marks	982	2,214	125·6
„ per head of population	marks	877	1,268	44·7
Amount of tax	1,000 marks	12,116	35,243	190·8

Capitalism in Prussia.

The income-tax in Prussia also gives a fair idea of the capitalism of 3/5ths of the German nation. The following are the main results arrived at from the assessments made during the period 1902—1904:

		Towns	Country	Total
Total population	1,000 persons	15,031	19,520	34,551
Zensits assessed with a rateable income of over 6,000 marks (including dependents)	1,000 persons	1,951	2,821	4,773
Percentage of the total population	per cent	13·0	14·5	13·8
Assessed income	million marks	47,581	28,076	75,657
viz.:				
Capital	„ „	23,236	5,552	28,788
Landed property	„ „	17,312	10,936	28,248
Capital invested and working capital	„ „	9,034	1,435	10,469
Independent exemptions and privilegies	„ „	68	67	134
Capital value of debts exempt		10,207	4,211	14,418
Amount of tax	1,000 marks	23,874	13,042	36,917
Per head of population . .	marks	1·59	0·67	1·07

The amount of property-tax levied may be divided as follows:

Value of property in marks	Number of persons taxed		Amount of taxes levied	
	1,000 persons	percentage	Million marks	percentage
6,000–52,000	140·2	80·2	9,373	25·4
52,000–500,000	240·5	18·5	15,021	40·7
Over 500,000	16·8	1·3	12,523	33·9

The 6,601 millionaires assessed (0·51 of all persons paying income) paid alone 8,888,000 in taxes, i. e. 24·07 per cent of the total amount levied.

Bavarian private income-tax.

The Bavarian private income-tax showed the following difference in the 16 years between the financial periods 1882/83 and 1898/99. The number of persons assessed increased by 15·7 per cent. Among persons drawing quite small incomes—of 40 to 100 marks—from investments of capital, the increase amounted to only 2·6 per cent; among those drawing an income of 400 to 1000 marks the increase in number amounted to as much as 17 per cent, while the wealthy class, with private incomes of more than 12,000 marks, has more than doubled.

During this period the population of Bavaria increased about 12·6 per cent, while the amount of income-tax levied increased 55·4 per cent.

Savings-banks.

The condition of the savings-banks also testifies to the spread of improved conditions. The following figures are for Prussia:

	1880	1901	Increase in percentage
Savings-bank books (thousands)	2,942	9,035	207
Number of books per 100 inhabitants . .	10·8	25·8	139
Amounts deposited (million marks) . . .	1,595	6,236	291
Amount per book (marks)	543	691	27

The number of savings-bank books in Prussia has consequently been more than trebled during the 21 years from 1880 to 1901, and in 1901 amounted to over 9 millions, so that every fourth person has a book. In 1880 there was only one savings-bank book to every 9 inhabitants. The total amount deposited has increased during this period to nearly four times what it was, and at the end of 1901 had grown to 6 1/4 milliard marks. Of the books themselves, 27·9 per cent were for amounts up to 60 marks, 28·3 per cent between 60 and 300 marks, 39·2 per cent between 300 and 3,000 marks, and 4·2 per cent were over 3,000 marks.

Up to the end of 1900 the amounts deposited throughout the whole Empire had grown to 8·86 milliard marks, and were distributed among 13,860,000 books; this means one savings-bank book to every four inhabitants of Germany.

Wages.

A further proof of the improved financial status of the majority of the population is furnished by the rise in wages; this can, to a certain extent, be traced by following the amounts paid in to sick and old age assurance societies.

The following table shows how every hundred weekly contributions are distributed among the various wage classes:

Class	Yearly earnings	1891	1901
I.	Below 350 marks	25·3	17·9
II.	351–550 „	38·4	33·6
III.	551–850 „	21·7	23·9
IV.	851–1,150 „	14·6	16·2
V.	Above 1,150 „		8·4 = 24·6

The relative proportion of wages of small amounts has steadily decreased since 1891. The fact that in 1891 a new class or division for wages amounting yearly to over 1,150 marks had to be added to the four existing ones, shows clearly the tendency of the level of wages to rise generally.

When one considers that the average chargeable wages (in 64 co-operative associations) were 612 marks in 1888 and (in 65 co-operative associations) 804 marks in 1901, that in the Ruhr district the average daily wages paid in the whole mines of 3·21 marks during the five years from 1888/92, had risen to 3·95 marks in the five years from 1898/1902, and that the average yearly income had risen during the same period from 987 marks to 1,223 marks, it is quite evident that increased national property has favourably affected all grades of society.

Consumption of commodities.

The increased consumption of commodities confirms this. To-day there is a very much larger consumption per head of the most important provisions and raw materials than there was 20 or 30 years ago.

Specification of goods	Consumption			Compared with	
	yearly average in	total	per head	yearly average in	consumption per head
		1,000 ts	kgs		kgs
Rye	1893/1901	8,026	148·6	1880/84	121·0
Wheat and spelt	„	4,765	88·2	„	about 65
Barley	„	3,716	68·8	„	46·6
Oats	„	5,960	110·4	„	82·1
Potatoes	„	31,886	590·5	„	339·9
		10,000 hls	liters		liters
Alcohol	1902	351	6·1	1889	5·4
for trade purposes	„	111	1·9	„	0·9
Beer	1901	7,080	124	1879/83	85
in North Germany	„	4,709	105	„	63
in Bavaria	„	1,524	245	„	213
		1,000 ts	kgs		kgs
Tobacco	„	93	1·6	1876/80	1·7
Salt in the whole	„	1,040	18·2	1877/81	13·3

Specification of goods	Consumption			Compared with	
	yearly average in	total 1,000 ts	per head kgs	yearly average in	consumption per head kgs
Salt for the table	1901	436	7·6	1877/81	7·7
Sugar	1902	669	11·6	„	5·8
Coal (black and brown)	1901	152,138	2,667	1876/80	1,170
Pig-iron	„	7,857	137·8	„	51·6
Petroleum	„	1,027	17·7	„	5·4
Raw cotton	1902	336	5·79	„	2·86
Foreign spices	„	8·9	0·15	„	0·12
Salted herrings	„	235	4·06	„	2·38
Raw coffee	„	171	2·95	„	2·33
Cocoa beans	„	19·6	0·34	„	0·05
Rice	„	129	2·23	„	1·66
Fruits, foreign	„	145	2·51	„	0·61
Tea	„	3·4	0·06	„	0·03
Jute	„	133·9	2·31	„	0·32

The consumption of wheat and potatoes per head is subject to fluctuation from year to year according to the harvests and prices; on an average however the consumption of wheat has risen by 1/4, and of potatoes by 2/3rds per head during the last 20 years. The increase in the consumption of alcohol must be attributed exclusively to the increased use of spirits in various industries, which has doubled since the close of the eighties; the consumption of brandy for private purposes shows a slight but constant decrease during the same period. Likewise the consumption of beer, which was increasing considerably until a few years ago, now shows a tendency to decrease. The same with tobacco. Salt is consumed at a constant rate per head, while the consumption of rock salt for feeding animals and other purposes has been doubled in the last 20 years. The amount of sugar used has also been doubled.

The years 1901 and 1902, it is true, show a noticeable decrease in consumption, but this is doubtless only temporary, as in consequence of the Brussels Convention the prices of sugar have fallen. The consumption of coals and pig-iron has increased two and a half times during the last 25 years, and of petroleum three times. Among commodities coming exclusively from foreign parts, cocoa and jute show the greatest increase, almost 7 times as much being supplied as 25 years ago. The consumption of foreign fruits has increased 5 times, that of cotton twice. There is also a large increase in the amount of tea, herrings and rice consumed. Butcher's meat averages at present over 40 kgs per head per annum; in 1860 it only amounted to 17 kgs.

Prices. This increase in the consumption of commodities is due in the first place to the increased purchasing power of the masses, and wages having risen, and prices, in many cases, having fallen through improvements in modern technology which have immensely increased industrial productivity, and developed and cheapened means of transport.

In the case of 29 important wholesale commodities, the prices have experienced an average decrease of about 1/4 during the last generation.

In some instances the fall in prices has been still greater; for instance, sugar has been reduced by a good half*) in price (not taking into consideration the further considerable reduction as a consequence of the Brussels Convention since held), cotton and spirits by nearly half, wool, pig-iron and lead by more than 1/3rd. On the other hand butcher's meat has risen 7 per cent in price, coals 11 per cent, comparing the average prices during the years 1871 to 1880 with those of the years 1891 to 1900.

There has also been a general rise in rents. Still enough has been said, to prove beyond a doubt that the German nation has advanced greatly in its standard of comfort and wealth during the last generation.

XI. Foreign trade.

Development of German foreign trade. In the year 1903 a foreign trade amounting to 85 million tons, and of a value as far as can be at present calculated of 11·4 milliards of marks passed through the German customs**). German foreign trade has reached this high level through development which commenced in the fourth decade of the 19th century, and which has rapidly increased with every decade. The progressive returns of the German customs are shown in the following table:

	1880	1890	1895	1900	1901	1902	Increase in percentage 1880–1902
	Million marks						
Imports	2,844	4,273	4,246	6,043	5,710	5,806	104
Exports	2,977	3,410	3,424	4,753	4,513	4,813	62
Total . . .	5,821	7,683	7,670	10,796	10,223	10,619	83
Per head of the average population of customs district							
	Marks						
Imports	63·9	86·5	81·4	107·4	100·0	98·8	55
Exports	66·8	69·2	65·6	84·5	79·1	81·9	23
Total . . .	130·7	155·7	147·0	191·1	179·1	180·7	38

*) The considerable decrease in prices due to the influence of the Brussels Sugar Convention is not included in this return.

**) The figures will be considerably higher when the definite special values are ascertained.

The value of the foreign trade, as we have seen above, has increased in a considerably quicker ratio than the population. In the year 1902, the foreign trade represented 181 marks per head of the population as compared with 131 marks per head in 1880, i. e. an increase of almost 2/5 per head. In 1903 the amount per head was estimated at almost 200 marks.

German foreign trade in 1902.

		Imports	Exports	Total
Total imports and Exports*)				
		1,000 ts	1,000 ts	1,000 ts
Quantity	Total	44,134·5	36,075·1	80,209·6
	Precious metals, included in above	1·2	0·4	1·6
		In million marks		
Value	Total	6,093·5	5,130·8	11,234·3
	Precious metals, included in above	174·8	135·0	309·8
Special trade) in the year 1902***)**				
		In thousand tons		
Quantity	Total	43,335·7	35,029·6	78,365·3
	Precious metals, included in above	1·2	0·4	1·6
		In million marks		
Value	Total	5,805·8	4,812·8	10,618·6
	Precious metals, included in above	174·8	135·0	309·8

Increase in weight. In 1880 the weight of the merchandise in special trade amounted to 30,572,000 tons; thus there has been an increase of 156 per cent by 1902†), whereas in the matter of value the increase has been over 83 per cent.

*) The whole export and import trade comprises: 1. Importation of general goods except bonding-house and credit goods, the importation of raw material for manufacture and the importation of bonding-house credit goods. 2. The exportation of general goods, including those subject to a home duty (beer, brandy, salt, tobacco, sugar), the exportation of all manufactured goods, as also of bonded and credit goods.

**) The special trade comprises: The import of general goods, direct or with bills of lading, the import of general bonded or credit goods, and the import to undergo manufacture on home account. The export of general goods, including those home wares exported under customs supervision and subject to a consumption tax (beer, &c.), and export goods after they have undergone manufacture on home account.

***) The figures obtainable for 1903 are: imports 47·0 million tons, valued at 6·3 milliards marks; exports 38·3 millions tons, valued at 5·1 milliard marks; total trade 85·3 million tons, valued at 11·4 milliard marks. The precious metals included in these figures represent a value in the imports of 315 million, in the exports of 116 million, together a total value of 431 million marks.

†) The increase in weight up to 1903 was 179 per cent.

Difficulty of exact statistics of foreign trade.

Owing to the geographical position of Germany in the centre of Europe, it is not always possible to determine with perfect accuracy the place of origin and destination of goods; for goods pass, not only through Dutch, Belgian and French ports, but also through Trieste and Genoa by the St. Gothard railway; England also is often erroneously regarded as the place of origin or destination of goods passing through Germany. In proportion to the growing independence of Germany's trade beyond the seas, this error has gradually declined in importance. Finally, the free port of Hamburg is a factor liable to cause errors in German trade statistics. Still the reports returned by the admirably systematised statistics of German foreign trade may be looked upon as fairly reliable.

More than 1 per cent of the whole German trade in 1902 fell to the following countries:

	Million marks	Percentage
1. Great Britain	1,576·1	14·86
2. United States of America	1,360·3	12·82
3. Austria-Hungary	1,252·6	11·80
4. Russia and Finnland	1,145·7	10·79
5. The Netherlands	599·7	5·56
6. France, with Algeria and Tunis	269·7	5·37
7. Belgium	457·4	4·31
8. Switzerland	454·0	4·28
9. Italy	322·5	3·04
10. British India, with Indo China and Malacca	308·6	2·91
11. Argentina	249·0	2·34
12. Denmark	205·8	1·04
13. Sweden	199·6	1·88
14. Australia	165·7	1·56
15. Brazil	162·4	1·53
16. Chili	145·3	1·37
17. Roumania	134·0	1·26
18. Spain	130·7	1·23
19. Dutch Indies	114·4	1·08

Part taken by the several countries in German imports.

This list undergoes some alternation if imports and exports are taken separately. Taking countries with a trade of over 20 million marks in 1902, the order was as follows:

Imports into Germany in 1902.

Countries of Origin	Million marks	Percentage
1. United States of America	911·1	15·7
2. Russia and Finland	773·6	13·3
3. Austria-Hungary	719·5	12·4
4. Great Britain	610·6	10·5
5. France, with Algiers and Tunis	315·4	5·4
6. British India, with Ceylon and Malacca	238·4	4·1
7. The Netherlands	206·1	3·5
8. Argentina	201·8	3·5
9. Belgium	196·7	3·4
10. Italy	192·5	3·3
11. Switzerland	138·7	2·9
12. British Australia	120·2	2·1
13. Brazil	118·6	2·0
14. Chili	113·0	1·9
15. Dutch Indies	90·9	1·6
16. Roumania	84·2	1·5
17. Sweden	80·5	1·4
18. Spain	74·9	1·3
19. Denmark	74·7	1·3
20. China, with Hongkong and Kiauchaou	55·6	1·0
21. Egypt	45·6	0·8
22. British West Africa	43·0	0·7
23. Turkey	36·6	0·6
24. Central American Republics	33·0	0·6
25. British South Africa	26·2	0·5
26. Norway	23·8	0·4
27. Free-ports of Hamburg and Cuxhaven	22·3	0·4

German Export in 1902.

Land of destination	Million marks	Percentage
1. Great Britain	965·5	20·1
2. Austria-Hungary	533·1	11·1
3. United States of America	449·2	9·8
4. The Netherlands	393·6	8·2
5. Russia and Finland	372·1	7·7
6. Switzerland	285·3	5·9
7. Belgium	260·7	5·4
8. France, with Algiers and Tunis	254·3	5·3
9. Denmark	131·1	2·7

Land of destination	Million marks	Percentage
10. Italy	130·0	2·7
11. Sweden	119·0	2·5
12. British India, with Ceylon and Malacca	70·2	1·5
13. Free-ports of Hamburg and Cuxhaven	61·3	1·3
14. Norway	61·3	1·3
15. Spain	55·8	1·2
16. Japan	49·8	1·0
17. Roumania	49·5	1·0
18. China, with Hongkong and Kiauchaou	48·8	1·0
19. Argentina	47·2	1·0
20. British Australia	45·5	1·0
21. Brazil	43·8	0·9
22. Turkey	43·3	0·9
23. British North America	38·7	0·8
24. Mexico	34·1	0·7
25. British South Africa	33·1	0·7
26. Chili	32·3	0·7
27. Dutch India	23·5	0·5
28. Portugal	20·4	0·4

Export from 1880 to 1902 classified according to countries and routes.

Commercial intercourse is most characteristically represented by following its development according to geographical features. The results are as follows:

		Million marks					
		1880	1890	1895	1900	1901	1902
I. European countries with trade carried on exclusively or almost exclusively by land*)	Import	1,197	1,686	1,244	1,657	1,540	1,620
	Export	1,367**)	1,275	1,299	1,809	1,703	1,797
	Total	2,564	2,961	2,543	3,466	3,243	3,417

*) Free-harbors Hamburg, Cuxhaven, Bremerhaven, Geestemünde, Baden tariff exemption, Austria-Hungary, the Netherlands, Belgium, Switzerland, France (up to 1895 including Algeria and Tunis).

**) Hamburg and Bremen acceded to the Imperial Tariff Union in 1889. The figures of foreign trade in these districts up to that time, as well as goods produced and consumed there, included articles belonging chiefly to trade by sea. Hamburg and Bremen had 600,000 inhabitants in 1880. Taking for granted that dutiable articles valued at 300 marks were consumed per head, 180,000,000 marks worth of German goods sent there for export belonged to land trade, and the remaining 480,000,000 marks worth to maritime trade; these are best included in the countries under group III, as all reliable items concerning their source or destination are lacking. The import into Germany from Hamburg and Bremen in 1880, was inconsiderable, so that the total import at that time can be included without hesitation in the maritime trade from countries in group III.

		Million marks					
		1880	1890	1895	1900	1901	1902
II. European countries with trade carried on chiefly by sea*)	Import	424	748	793	984	975	1,040
	Export	341	381	407	586	571	610
	Total . .	765	1,129	1,200	1,570	1,546	1,650
III. European countries with trade carried on exclusively or almost exclusively by sea**)	Import	887	799	783	1,135	944	932
	Export	1,022	1,006	924	1,293	1,265	1,346
	Total . .	1,909	1,805	1,707	2,428	2,209	2,278
IV. United States and British North America	Import	170	408	512	1,027	1,050	920
	Export	192	432	385	460	412	488
	Total . .	362	840	897	1,487	1,462	1,408
V. Mexico, Central and South America	Import	66	363	445	571	543	557
	Export	25	174	219	239	211	216
	Total . .	91	537	664	810	754	773
VI. Africa	Import	17	51	79	147	126	164
	Export	5	22	43	73	71	92
	Total . .	22	73	122	220	197	256
VII. Asia	Import	66	165	268	392	416	443
	Export	22	96	122	242	222	216
	Total . .	88	261	390	634	638	659
VIII. Australia	Import	8	51	119	125	111	123
	Export	2	23	23	50	55	47
	Total . .	10	74	142	175	166	170

Although no exact comparison can be made between the figures of the various years for many reasons,—viz., alteration in tariff districts, alteration and improvement in statistical methods and organisation of commerce—the above table gives a clear view of the geographical development of German commerce with foreign countries. Trade with foreign continents has increased considerably more than that with European countries, although not in such proportions as appear from the figures.

Maritime and land trade.

In order to fix the proportions which land and maritime trade bear to each other, the low figures in group II can be calculated as equivalent to the inconsiderable maritime trade in group I. The annual maritime trade percentage of the total trade is as follows:

	1880	1890	1895	1900	1901	1902
Imports	57·8	60·5	70·7	72·6	73·0	72·1
Exports	54·0	62·6	62·0	61·9	62·2	62·6
Total trade	56·2	61·4	66·8	67·9	68·3	67·8

*) Russia (up to 1895 including Finland), Italy, Denmark, Servia.

**) Tariff exemption: Heligoland, Great Britain and Ireland, Greece, Sweden, Norway, Finland (since 1900), Gibraltar, Malta, Cyprus, Spain, Portugal, Bulgaria, Roumania, Turkey (up to 1895 including Asiatic and African provinces).

Although the land-trade in 1880 was only slightly less than the maritime trade, at the close of the century the latter had increased to double the amount of the land-trade. The increase is rather due to greater imports than to exports.

The transformation in the character of foreign trade.

The most significant aspect of the development of German foreign trade, in addition to its increase in quantity, is the complete transformation in its character. Since 1870 Germany has developed from a country engaged chiefly in exporting agricultural products to one in which importation of such products predominates. In former times the export of agricultural products served chiefly as payment for the importation of industrial and tropical products.

At the present time 1/4 of the food required in Germany is imported from foreign countries; industry also demands constantly increasing amounts of raw materials from foreign countries for its products. Imports, on the contrary, consist chiefly of manufactures, which are constantly becoming more qualified.

The development made in this direction during the last decade was as follows:

	Import (value in million marks)			
	1891–1895	1895–1900	1901	1902
Raw materials for industrial purposes	1,762·1	2,404·1	2,510·8	2,600·6
Manufactures	964·3	1,137·8	1,145·0	1,189·8
Articles of food and table delicacies; live stock	1,629·5	1,852·3	2,071·3	2,128·3
Precious metals, in bars or coined	223·8	276·4	289·1	174·8
Total	4,579·7	4,670·6	6,016·2	6,093·5
	Export (value in million marks)			
	1891–1895	1895–1900	1901	1902
Raw materials for industrial purposes	727·2	978·3	1,132·5	1,211·9
Manufactures	2,104·1	2,630·3	2,987·8	3,182·3
Articles of food and table delicacies; live stock	597·5	671·2	623·7	601·6
Precious metals, in bars or coined	141·8	189·4	81·2	135·0
Total	3,570·6	4,469·2	4,825·2	5,130·8

The summarised figures of import and export are as follows:

	Excess of imports of: articles of food, table delicacies and live stock	Excess of imports of: raw materials for industrial purposes	Excess of exports of manufactures
	Million marks		
1890	926·3	1,059·1	1,194·8
1892	1,134·3	1,023·6	1,109·3
1894	1,023·2	997·8	1,052·6
1896	1,031·3	1,112·8	1,387·2
1898	1,315·0	1,390·2	1,387·5
1900	1,245·2	1,691·7	1,782·7
1902	1,542·0	1,397·4	1,986·2

The trade returns of 1902 showed the following figures, classified under the heading of the various goods. Only such classes are included which exceed 200 million marks in import and export:

	Imports	Exports
	Million marks	
I. Cattle and living animals	241·6	19·5
II. Waste materials, fertilizers and various animal products	214·8	42·8
III. Fuel	165·4	270·3
IV. Articles of food and table delicacies		
1. Raw materials	1,564·3	263·5
2. Manufactures	322·4	318·6
V. Raw materials and manufactures from fat, fatty and mineral oils		
1. Raw materials	225·8	19·0
2. Manufactures	154·8	37·0
VI. Raw materials and manufactures of the chemical and pharmaceutical industry		
1. Raw materials	211·8	44·6
2. Manufactures	113·1	388·3
VII. Raw materials and manufactures of the metal industry, with the exception of machines, instruments and apparatuses		
1. Ore	106·1	14·9
2. Crude, common metal, including coins	164·9	136·1
3. Plainly worked articles	13·4	183·4
4. Manufactures	29·1	416·8

	Imports	Exports
	Million marks	
VIII. Raw materials and manufactures of the wood-working, wood-carving and cane industries		
1. Raw materials	107·0	52·3
2. Plainly worked articles	146·5	39·5
3. Manufactures	37·6	88·4
IX. Raw material and manufactures of the leather, oil-cloth and fur industries		
1. Raw materials	186·5	86·5
2. Manufactures	154·3	234·1
X. Raw materials and manufactures of the textile and felt industries; wearing apparel		
1. Raw materials	854·5	182·5
2. Manufactures	479·1	1,030·4
XI. Machines, instruments and apparatuses	87·5	324·0

Commercial balance-sheet.

In order to counterbalance the total negative results of commercial movements, which, including the trade in precious metals, is shown in the following figures, viz., 1890 863 millions, 1892 1,077 millions, 1894 1,234 millions, 1896 805 millions, 1898 1,429 millions, 1900 1,290 millions, 1901 1,198 millions, 1902 993 millions. To these figures must be added the receipts of the sea carrying industry, estimated at present at 300 millions, the many hundreds of million marks profit derived from German capital invested in foreign enterprises the incomes of German capitalists trading in foreign stocks and bonds*) and from operations on foreign exchanges, the receipts from insurance enterprises, the income from the German cable, only in the beginning of its development, and finally the receipts from the constantly increasing number of foreigners travelling in Germany—whereby the expenditures of Germans travelling in foreign countries must be correspondingly allowed for.

Trade with foreign countries and inland market.

A comparison of the development of trade with foreign countries and the increase of inland productive power proves that the receipts from German work increase home consumption, and that the inland market with the consumptive power of the general public has increased more rapidly than foreign trade.

*) According to reliable information the investments of German capitalists in foreign countries are placed at 15–16 thousand milliards at least one-half of which are invested in countries outside Europe.

XII. Transport and Communication.

A. Post, Telegraphs and Telephones.

Increase in business of the Imperial Post.

Within the jurisdiction of the Imperial Post, which serves 4/5ths of the whole Empire, there has been, since 1870, an enormous increase in business. Whilst the population during the years 1872–1902 has increased by two-fifths, the number of post-offices at the end of this period has become 5 1/2 times larger, the staff of employees four times, the number of letters, packges, &c. sent seven times, and the number of telegrams transmitted four times as many as at the beginning of that period. The number of remittances of money, according to the total sum transmitted by the Post, is nearly double what it was, whilst the total receipts have increased to more than four times their former amount. The only department showing a falling-off in business is the travelling post, the number of passengers carried decreasing from 5·6 million to 1·2 millions. Wherever modern means of transport are making headway, there is no room left for the latter mode of conveyance.

The postal systems of Bavaria and Wurtemberg have developed in a manner similar to that of the Imperial Post.

Statistical summary of the entire German Postal System.

The entire German Postal System was composed at the end of 1902 as follows: about 38,200 post-offices—or one office to every 14·2 sq.-kms and every 1,480 inhabitants, 126,500 letter-boxes serving to effect the transmission of 6·2 milliard postal despatches in one year. For this purpose the post-office vehicles and officials covered a distance of 338 million kilometres, i. e., 248 million kilometres by rail, 88 million kilometres by road, and a further 1·2 million kilometres by German canals, &c. The marine mail covered an additional 13 million kilometres. (These figures do not include postal messenger service.)

Postal despatches.

Eight-ninths of the total number of postal despatches travelled only within the boundaries of the Empire; 246 million came from foreign countries and German protectorates, whilst 291 million were sent thence from within the Empire. At a rough calculation another 168 million foreign despatches traversed the Empire upon their way to other countries.

Half the total number of dispatches consisted of letters (2 milliard) and post cards (1·2 milliard). The number of post cards sent has doubled during the last five years in consequence of the constantly growing craze for collecting picture post-cards. The enormous increase in the number of letters, too, was largely due to the acquisition by the State of the private postal institutions existing in many of the large towns, as well as to a considerable reduction in the fees for local postage. Besides this 931 million "printed matter" packets were transmitted, 72 million "samples," 10 million "business papers" and no fewer than 1·4 milliard copies of newspapers and 210 million

special supplements to newspapers; 45 million of these despatches were registered. The traffic in packages and valuables further include 201 million ordinary packages, and 13·5 million packages, letters and cases with statements of value enclosed. The business in money transmission included 172 million despatches, the total sum transmitted in valuables and money amounting to 29·3 milliard marks.

In the year 1902 a total number of 103 postal despatches per head of population were transmitted in Germany, made up of 52 letters and post-cards, 44 "printed matters, communications, newspapers and samples," 3 postal money-orders, and nearly 4 packages, &c., containing valuables.

The total number of persons travelling in postal conveyances was 3 millions.

Telegraphs.

The second great means of communication, the telegraph, although an invention of the latter half of the nineteenth century, is to-day scarcely of less importance than the postal system. There was in 1902 a telegraph-office to every 20·3 sq.-kms or every 2,114 inhabitants. The lines measured 134,000 kms, with 496,000 kms of wires. The number of telegrams sent by the 26,700 telegraph-offices was 45·2 million, 32·1 million being sent within the Empire itself, making an average of 80 telegrams per 100 inhabitants.

Telephone.

During the last two years a third means of communication, the telephone, has likewise developed to quite an extraordinary extent. At the end of 1902 there were 67,000 kms of municipal lines with a total length of cable mains amounting to 1,088,000 kms, and distributed among 18,610 places. The telephone connections measured 358,000 kms in length. There were 393,000 call-stations (4,000 of them public ones) and the number of conversations in the year was 843 million, 112 million conversations being exchanged between call-offices of different places.

The postal district of Berlin remains the greatest telephone centre of the world. It has over 65,000 call-offices and 209,000 kms of connection mains. In 1902 the number of conversations exchanged daily, was 433,000.

Within the Imperial Postal district there was 1 call-office to every 27·4 sq.-kms and every 2,952 inhabitants. In 1900, 632 places abroad were connected with Germany by telephone. The largest direct cable main is the Paris-Berlin line, which was completed in 1899 and measures 1,150 kms. This also transmits the telephone communication between Berlin and Bordeaux, a distance of 1,750 kms.

German Post-Offices in the German protectorates and abroad.

In the German Protectorates beyond the seas, and in Constantinople, Beyrout, Jaffa, Jerusalem, Smyrna, Tangiers, Shanghai, Hankau, Peking, Tientsin, Tongku, Chefoo, Shanghaikwan, Weihsin, Tsingkiang, Amoy, Canton (since 1903 also in Nanking), and a number of postal agency establishments, there were at the end of 1902 altogether 108 German post-offices and 27 telegraph-stations.

German submarine cables. Among the German telegraph lines, the submarine cables are worthy of special notice. With the exception of several lines communicating with the islands in the North Sea and the Baltic, measuring altogether 570 kms in length, they serve exclusively for the purposes of international communication. 7 cables, with a total length of 2,205 kms, are the property of the Imperial Post-Office, 2 of which, with a length of 1,158 kms, are in East Asia. An eighth cable, the Greetsiel-Valentia line, is not in use. There are 6 other cables which Germany owns in common with other countries. Germany's share in these, measures 937 kms in length. In addition to these there are 5 private cables which are worked by the Imperial Post-Office. Their total length is 10,628 kms, and they include the Borkum-Vigo line, the property of the German Marine Telegraph Company, measuring 2,065 kms, and the Borkum-Horta-New York line of the German Atlantic Telegraph Company measuring 7,674 kms. The latter company is at present laying a second cable between Borkum and New York, and further lines for forming connections with transmarine possessions are already planned.

Official Staff. In 1902 an official staff of 240,000 persons was required to carry on the work of the entire postal, telegraph and telephone system of Germany. This number was composed of 98,000 officials, 106,000 subordinate officials and 36,000 assistants. The number of female clerks employed is on the increase; in 1902 12,400 females were employed in the Imperial Post, 9,700 having the position of officials. Among the 6,551 officials employed in the telephone service, as many as 5,725 were females.

Revenue and Expenditure. The total revenue of the Postal, Telegraph and Telephone systems amounted in 1902 to 494·6 million marks, and the expenditure to 444·5 million marks.

Social significance of the Post-Office. A special public task has been assigned to the Post-Office by the legislative provisions for the protection of the working classes. The Post-Office sells insurance stamps for old age pensions and pensions for persons incapacitated for work. It also pays the sick, accident, old age, and incapacity pensions. In 1902 the Imperial Post-Office sold 420 million insurance stamps amounting in value to 112 million marks. It paid:

Class of payments	Amounts paid in millions of marks	1,000 persons receiving payment	1,000 payments
Accident insurance	90·7	792	5,323
Pensions for persons incapacitated for work.	65·3	534	5,373
Old age pensions	20·9	170	1,878
Sick annuities	1·3	14	97
Subscriptions refunded . . .	6·3	165	330
Total . . .	184·5	1,675	13,001

B. Railways.

1. Full-gauge Lines.

Railway system.

At the end of the financial year of 1902 the full-gauge lines of the German Railways measured a length of 52,004 kms. More than a third of the system (18,580 kms) consisted of two or more tracks. More than three-fifths (32,718 kms) were main lines, almost exclusively the property of the Government, only 1,260 kms being private property.*) Of the 19,287 kms of branch lines, by far the greater part is State property, only 3,334 kms belonging to private concerns.**) Consequently, more than nine-tenths (91·2 per cent) of the full-gauge lines are the property of the State. The greatest railway system in Germany under one management is the Prussian-Hessian State Railway; its total length of track measures 31,998 kms. The Bavarian State Railway has 5,916 kms of track, the Saxon State Railway 2,668 kms, the Wurtemberg 1,803 kms, the Imperial Railway system in Alsace-Lorraine 1,670 kms, and the Baden State Railway 1,655 kms.

The total length of track was made up of 70,943 kms of "through" lines and 26,936 kms of shunting lines, sidings, &c.

The network of German railways grows annually by about 2 per cent, which increase is almost entirely due to the building of branch lines, the system of main lines being complete.

In 1901 there were 94·4 kms of railway in Germany to every 1,000 sq.-kms of country, and 89·8 kms to every 100,000 inhabitants. As far as larger areas are concerned, the network of lines is most dense in the Kingdom of Saxony, which has 163·8 kms of line to every 1,000 sq.-kms, in Rhineland, which has 139·8 kms, and in Westphalia, which has 129·8 kms. In the principal industrial district of Germany, that of Ruhr, the length of line per 1,000 sq.-kms amounts even to 346 kms. The railways are fewest in East Prussia with 62·7 kms to every 1,000 sq.-kms, in Pomerania, with 63·6 kms, and in West Prussia, with 65·5 kms.

Invested capital and cost of working.

In 1902 the capital invested in main and branch lines amounted to 13·46 milliard marks, or 259,000 marks per km. The cost of maintenance, repairs and extensions throughout the whole system, including telegraphs, amounted to 243 million marks. At the end of 1902 there were 20,296 locomotives in use, and the rolling stock numbered 41,259 passenger cars, 424,019 luggage cars and trucks. Of the passenger cars, 10 had six axles, 3,033 four axles, 11,507 three axles, and 26,709 two axles, whilst of the freight cars 4,628 had four axles, 6,245 three axles, and 413,146 two axles. In addition to this there were 2,332 post-office cars in use. The passenger cars could seat 1,892,000 persons, i. e., 54,000 in the first class, 291,000 in the second class, 1,122,000 in the

*) 483 kms of private line was transferred to the Prussian-Hessian Railway Company in 1903.

**) 257 kms of branch line was transferred in 1903 to the State of Prussia.

third class and 426,000 in the fourth class. The total load carried by the goods wagons amounted to 5,287 million tons, or 6·12 tons per axle.

Passengers and goods carried.

The number of passengers conveyed amounted to 891 million persons; there were 1 million tons of luggage, and 366 million tons of freight. The average payment paid by each passenger per km was 2·69 pfennig; the rate paid for every ton of freight per km 3·68 pfennig. Each passenger was carried an average distance of 23·7 kms, and every ton of freight 100·1 kms. The total number of kilometers travelled by all passengers amounted to 21,092 million, and that traversed by freight (if reduced to 1 ton) was 36,687 million. The prime cost of the rolling stock amounted to 2,572 million marks, and its maintenance during 1902 to 188 million marks. The receipts totalled 2,025 million marks, and the expenditure 1,311 million marks, leaving a surplus of 714 million marks, or 5·4 per cent on the invested capital. The total number of workmen and officials employed was 545,000.

Rentability.

2. Narrow-gauge main lines.

Narrow-gauge lines.

In addition to the full-gauge lines, there are a further 1,879 kms of narrow-gauge track in public use. 849 kms were the property of the State, and 1,030 kms private property. The receipts from these lines amounted to 10·3 million marks, and the expenditure to 8·7 million marks. This made the interest on the invested capital of 120 million marks (69,000 marks per km) only 1·4 per cent. In 1902, 23 million passengers and 7·2 million tons of goods were conveyed on these lines.

"Small" railways.

An important part is played in Prussia by the local tertiary railways which are termed "small railways" (Kleinbahnen), in the Act of July 28th 1892. At the end of 1901 they comprised 3,000 kms of street railways, and 5,700 kms of "small railways" resembling the above-mentioned branch lines.*) Amongst the Tramway concerns of Germany, the "Great Berlin Tramway Company," is worthy of special notice. Apart from the three suburban systems which it controls, its lines measure in all 237 kms, and its cars number 2,574, with a seating capacity for 83,500 passengers. The number of passengers carried during the year 1901 was 277 million. By far the greater number of German street railways are driven by electricity, only 3·3 per cent of the total length of line being used in 1901 for horse cars, and 5·9 per cent for steam cars. On the other hand, only 4 per cent of the small branch lines are driven by electricity, the remainder being driven by steam. Three-fifths are under the direction of large establishments which control a number of separate undertakings on uniform principles. One Berlin firm alone has a network of lines measuring over 2,200 kms under its control. As many as 34 per cent (1,952 kms) of the local small lines are the property of municipalities, and nearly half are run by them.

*) Outside Prussia the "small railways" are for the most part included in the system of larger lines under the head of "branch lines."

C. Inland navigation.

The inland water traffic of Germany has increased enormously of late years. Transport by water is for the most part carried on by means of the large natural rivers and steams, but latterly, owing to the rapid increase of traffic, it has been found necessary to employ artificial assistance in the shape of canals and cuttings.

Waterways. The length of the German waterways navigable for traffic, including the river mouths, measures 14,400 kms. This includes 9,300 kms of natural rivers, 2,470 kms of streams made navigable, and 2,470 kms of canals for barges. Besides this there are the "North Sea and Baltic" (Kaiser-Wilhelm) Canal 100 kms in length, and the Königsberg-Pillau Sea Canal measuring 32 kms in length. 2,400 kms of this system of waterway were navigable for boats of 1·75 meters draught, a further 3,100 kms for boats drawing 1·50 meters, and 7,100 kms for boats drawing 1 meter, while 1,800 kms were only navigable for boats drawing less than 1 meter.

Goods traffic on the waterways. As far as freight traffic is concerned, there are really only 10,000 kms of inland waterways that come under consideration. The freight transported over this distance amounted in 1900 to 46·2 million tons; 26 million tons were for inland traffic, 14·4 million tons came from abroad, and 5·8 million tons were exports. Four-fifths of the traffic fell to the share of the 7 principal rivers of Germany, whose total length is about 3,000 kms. The figures for each are as follows:

	Length in kilometers	Million kms traversed if reduced to one ton	1,000 tons of goods per km
Memel	161	88	550
Weichsel	239	159	670
Oder	650	1,042	1,600
Elbe	621	2,605	4,200
Weser	366	128	350
Rhine	570	5,292	9,290
Daunbe	384	34	90
Total	3,000	9,350	3,125
Total waterways . . .	10,000	11,500	1,150
German railways . . .	49,600	36,900	740

The goods traffic upon these waterways shows a very considerable development as compared with the railway traffic, for in 1900, 24 per cent of the total goods traffic within the Empire was effected by means of waterways and 76 per cent by railways. The annual amount of traffic over every kilometer of waterway was 1,150,000 tons (in the case of the 7 principal rivers as much as 3,125,000 tons) and over the kilometer of railway it was 740,000 tons.

The following are the ports which show the largest traffic returns:

	Arrived	Left	Total
	1,000 tons		
Ruhrort, Duisburg and district	5,485	8,867	14,352
Mannheim-Ludwigshafen	6,047	1,060	7,107
Berlin-Charlottenburg	5,902	735	6,637
Hamburg (river traffic)	2,526	3,175	5,701

Some distance behind comes Stettin with a river traffic of about 2·419 million tons; then Magdeburg with 1·995 million tons, Mayence, Kastell and Gustavsburg, Frankfort-on-the-Main and Breslau.

Vessels. At the end of 1902 the number of German vessels for inland navigation amounted to 24,681, with a total capacity of 4·8 million tons. These included 2·743 vessels with a capacity of less than 20 tons, 8·018 with a capacity of between 20 and 100 tons, 8·525 with a capacity of between 100 and 300 tons and 4·506 with a capacity of more than 300 tons.

There were 22·079 sailing vessels with a total capacity of 4·6 million tons, Engine, driven vessels (steam, petroleum, benzine, gas, electricity) numbered 2·602, with 144,000 tons capacity.

Navigation on the Rhine. More precise figures can be given for the Rhine. In 1901 there were 1·123 steamers and 8·379 sailing vessels. Among the former 9 per cent served exclusively, and 6 per cent partially for passenger traffic, 14 per cent only for goods traffic and 66 per cent for towing. The greatest transport capacity of a single freight steamer was 975 tons (and in the case of the sea-going steamers, not included here, 1,770 tons). The remaining vessels serving for freight transport have an average capacity of 326 tons. The largest carry more than 3,000 tons and draw 2·75 ms of water.

70 per cent of the h.p. of the steamers plying on the Rhine belonged to Germany, but in the case of sailing vessels and towed barges only 50 per cent of their loading capacity were under the German flag, 37 being Dutch, and 13 Belgian, etc. Vessels belonging to foreign nations also ply on other German rivers, but not nearly to the same extent.

XIII. Shipping.

The present highly developed condition of German shipping practically extends back only to the year 1870. The maritime trade of certain towns, such as Hamburg and Bremen, had, it is true always been of importance, but the actual shipping business carried on was only limited. Foreign flags

predominated in their harbours. Their ship-building yards turned out comparatively few ships, and the share which they had in deep sea fishing was very small indeed. Up to the year 1867 one of the most important conditions for any great activity in this direction was lacking; previous to that year there existed no flag common to the whole of Germany, and consequently no unity in Germany's maritime interests. It is only since the foundation of the North German Federation and of the German Empire that this state of affairs has altered. There are no comprehensive figures forthcoming to show the development of the industry until the year 1872/73.

A. Harbour Buildings and River Regulation.

The great technical progress in dredging and deep level working enabled Germany to overcome the difficulty experienced by ships in approaching her shores and river mouths. Since the beginning of the eighties and since Hamburg and Bremen joined the Customs Union (Zollverein), large modern harbours have been constructed on the Elbe and Weser, with enormous basins, quays, sheds and store-houses and practical means of transport between ships and railways. Since 1887 Hamburg has at different times been obliged to add three large new harbours to those already existing, and new basins have also been constructed at Bremerhaven and Cuxhaven. During the same period Bremen more than doubled its harbours and quays. The advantages which the Northern ports gained by joining the Customs Union resulted in the opening of the Kaiser Wilhelm Canal which threw these of the Baltic open to trade. This again gave an impetus to trade which led to the deepening of the Trave and to the building of a harbour at Lübeck as well as the construction of the Elbe-Trave Canal. The river Oder has been buoyed, channelled and regulated, and Stettin and its mouths supplied with a free harbour district of modern construction. The same has been done at Neufahrwasser for Danzig at the mouth of the river Weichsel, and the Haff Canal, a waterway of 7 ms in depth, has given to Königsberg the most modern harbour devices. Emden too has constructed a modern port with a depth of over 9 ms and a free district. The Dortmund-Ems Canal which provides a direct connection by water with the Westphalian Industrial regions must also be mentioned.

In addition to the above-mentioned expenditure amounting altogether to over 1,000 million marks, the construction of the various inland navigation canals which are at present projected must also be touched on. They comprise canals connecting the east and west, the deepening of the upper Weser, the Ems-Jade Canal, the canal for heavy shipping between Berlin and Stettin, the channelling of the upper Oder, the eastern canals, the construction of the Masovian Canal, &c. In short the problems in connection with harbour and canal construction are ones which have taxed the technical skill of high and low-level engineering to the utmost, and which have been solved or are shortly to be solved with the most brilliant success, either by the State or by private German enterprise.

B. Maritime Traffic.

The following are the figures for the maritime traffic in German ports for the year 1901:

	Arrived				Left			
	Total		In ballast or empty		Total		In ballast or empty	
	1,000 Vessels	Registd. tonn. in 1,000 ts	1,000 Vessels	Registd. tonn. in 1,000 ts	1,000 Vessels	Registd. tonn. in 1,000 ts	1,000 Vessels	Registd. tonn. in 1,000 ts
Total number of vessels . .	89·4	19,169	10·8	1,494	89·7	19,133	25·2	6,090
Steamers included in above	49·4	16,401	2·0	1,044	49·3	16,333	10·2	5,055
	Came from				Left for			
German ports .	54·3	4,410	8·6	852	54·6	4,399	9·5	868
Other European ports	32·8	9,409	2·2	626	33·3	10,280	15·5	4,907
Non European ports	2·3	5,349	—	15	1·8	4,454	0·2	315

The proportion of German shipping carried on under the German flag has considerably increased, particularly within the last 10 years, in consequence of the institution of regular shipping routes and lines to all parts of the globe.

Vessels engaged in traffic	1891		1901	
	Number	Tonnage	Number	Tonnage
	per cent			
German ships	72·8	51·9	76·5	59·4
Foreign ships	27·2	48·1	23·5	40·6
British ships included in above	8·2	30·7	5·7	22·0

As this table shows, the increase in the number of German vessels has been chiefly at the expense of the British ones.

If a registered ton is reckoned as equal to a ton weight, the quantity of goods carried works out as follows:—freight arriving, about 18 million tons; freight leaving, about 13 million tons; total, 27 million tons.*)

*) Since the traffic in goods between German ports is reckoned both in leaving and arriving, in order to ascertain the total amount of traffic it ought only to be reckoned once. Hence the difference between the figure for the total amount of traffic and the sum of arrivals and departures. The figures are, however, only given approximately in round numbers, since it is not possible to obtain quite accurate statistics for the total amount of traffic.

It must be borne in mind that a large proportion of German maritime traffic is carried from foreign ports, in consequence of the geographical position of the country as has already been pointed out and cannot therefore be calculated numerically.

C. Freights.

It is estimated that Germany had in 1800 a maritime traffic of 200,000 registered tons, in 1867, 700,000; in 1871 Germany owned 150 steamers with a capacity of 82,000 register tons and 4,350 sailing vessels with a registered tonnage of 900,000. Assuming a steamship ton to be equivalent to 3 sailing vessel tons, this would result in a capacity of transport equal to 1,146,000 registered sailing ship tons. On January 1st 1902, the position was as follows:

	Number	Thousand reg. tons		Crew
		gross	net	
Steam ships	1,463	2,446	1,506	40,411
Towed vessels (or lighters) . .	260	84	80	906
Sailing vessels	2,236	550	507	12,629
Total number of vessels	3,959	3,081	2,093	53,946

The transport capacity, now that a net steamship ton according to the altered circumstances in shipbuilding is equal to 4 sailing ship tons, amounted to 6·6 million sailing ship tons, or almost 6 times as much as 30 years ago.

The freight-carrying centers of Germany lie to-day entirely on the North Sea. The following table shows the ports to which the various vessels belong:

	Hamburg		Bremen		Baltic ports	
	Number	1,000 reg. tons, gross	Number	1,000 reg. tons, gross	Number	1,000 reg. tons, gross
Sailing vessels	348	223	141	178	361	26
Sea-going lighters . . .	102	36	125	42	15	3
Steam-ships	529	1,348	329	699	451	327
Total . . .	979	1,607	595	919	827	356
Per cent .	24·7	52·2	15·0	29·8	20·9	11·6

These figures show that no less than two-fifths (39·7 per cent) of the total number of ships, and over four-fifths (82 per cent) of the total loading capacity of the German commercial navy fell to the share of Hamburg and Bremen alone. The Baltic ports on the other hand now claim no more than a fifth (20·9 per cent) of the number, and a ninth of the loading capacity of the commercial fleet.

At one time freighting was carried on almost entirely by small establishments, but the tendency towards larger and giant concerns is to-day strongly in evidence. In 1886 Hamburg had only 4 large steam navigation companies, while in 1902 there were as many as 8 freighting companies with a fleet of over 50,000 tons, four of them over 100,000 tons, the Hamburg America Line with 620,000 tons being by far the largest. In 1902 Bremen had two freight fleets with over 100,000 tons, one being the North German Lloyd with over 500,000 tons.

The means at the disposed of the 6 largest German Joint Stock Shipping Companies, which control altogether more than half of the German merchant navy, amounted in 1902 to a nominal share-capital of 249 1/4 million marks and 112·3 million marks in preference debentures. The total value of German capital invested in shipping amounted to about 650 million marks. The annual receipts from freight and passenger transport of the German shipping firms are estimated at between 350 and 400 million marks.

The relatively short average age of the German merchant ships vouches for their high efficiency. The average age per gross register-ton of the sailing vessels was, at the beginning of 1902, about 17 years, that of the lighters about 9·1 years, and of the steam-ships 8·1 years, making an average for all sea-going ships of about 9·7 years.

The average size of the sailing vessels amounted to 246 gross register tons, of the sea-going lighters 322, and of the steam-ships 1,673, making an average for all vessels 779 gross register tons. There are at present 25 steamers with a lading capacity of over 10,000 tons, 12 of them carrying more than 12,000 register tons. 4 of these steamers possessed the high average speed of 22·5–23·5 nautical miles an hour. The record for transport capacity among sailing vessels is held by the five masted full-rigged ship "Preussen" with a hold capacity of 5,081 gross register tons and a tonnage of 8,500 (equal to 850 railway trucks of 10 tons each).

D. Ship-building.

Germany possesses 42 dock yards on the coast, 26 of which are for the construction of middle sized and larger sailing vessels, 13 on the Baltic and 13 on the North Sea. Three of this number are Imperial yards for the construction exclusively of warships, 5 or 6 are private yards adopted at present for the construction of warships and high speed steam-ships; 2 or 3 are capable of development in this respect, while 4 or 5 others serve exclusively for the construction of large and middle sized cargo and passenger steamers. The remainder are occupied in building smaller vessels.

These dockyards, apart from the Imperial yards, command a capital of about 110 million marks. 25 of the above-mentioned yards employed in 1899 more than 50,000 hands, and required for their works roughly 18,000 h.p., 136 dynamos, 572 electric and 51 other motors, 9,725 machines and 1,261 cranes with a total lifting capacity of about 9,000 tons. 43 of the 136 existing

ships were over 100 ms, and 17 were over 150 ms long. At the present moment there are about 25 slips for the construction of vessels of over 10,000 register tons.

For the purpose of repairs there are large docking arrangements in the fortified harbours, a dry dock of enormous dimensions at the mouth of the Weser, large floating docks on the Elbe and Oder and numerous slips. Smaller floating and dry docks are found at all seaports.

Up to the commencement of the nineties, Germany obtained more than two-thirds of her ships from abroad, principally from England. During the years 1900–1903 the average annual proportion supplied from abroad was only 28 per cent, while at the same time she built a number of ships for foreign countries which corresponded to 11·6 per cent of her own requirements.

In 1901 Germany turned out 230 steam-ships with a gross register tonnage of 261,000, and 211 sailing vessels with 30,700 gross register tonnage. In 1902 she built 227 steam-ships with 212,000 gross register tonnage and 280 sailing vessels with 58,700 gross register tonnage.

The following table shows the statistics for 1902:

	Steam-ships		Sailing vessels	
	Number	Gross registered tonnage	Number	Gross registered tonnage
Sea-going vessels of over 100 register tons	55	161,800	13	11,500
Sea-going vessels of under 100 register tons	—	—	33	1,900
River vessels	40	6,800	154	25,700
Special vessels (tugs, ice breakers, dredgers, &c.)	121	17,000	80	19,600
Warships	11	26,700	—	—
Total	227	212,300	280	58,700
Built for foreign countries	25	26,100	10	1,300
Built for the German Empire abroad	19	46,000	25	11,800

At the end of 1902 there were 121 steam-ships with a registered tonnage of 256,000 and 114 sailing vessels with a registered tonnage of 22,300 lying in German ship-yards in course of construction. These included 18 warships with 67,700 registered tons, 50 sea-going steam-ships, with 177,400 registered tons, 15 sea-going sailing vessels with 8,000 registered tons; while 13 sea-going vessels with a registered tonnage of 18,400 were being built abroad for the German Empire.

E. Institutions for the furtherance of Maritime Matters.

A number of important institutions have been started in Germany by the initiative of the State and of private individuals for the promotion of German maritime traffic and maritime affairs in general. Such institutions are the Nautical department of the Imperial Naval Office, the German maritime Observatory, the Institute for Maritime knowledge, the Naval Museum in Berlin, the departments for aquatic and marine construction at the Technical Colleges, Navigation Schools and Marine Engineering Colleges, the Fishery Schools and the organized nautical education of the youth of Germany by means of three training ships. The founding of the great inspecting body, the German Lloyd, was of the greatest importance. The three elaborately furnished testing stations for towing purposes at the Berlin Technical College, the North German Lloyd establishment at Bremerhaven and the "Kette" Company in Uebigau, serve for practical experiments of marine architects. Great activity has been shown by such private associations as the German Nautical Society and the German Sea Shipping Society, as well as by the professional representative associations of shippers and ship-builders, and of wharf and dock hands. The German Union for saving shipwrecked people has been a great blessing. The development of yachting has served to encourage enthusiasm for the sea while forming a source of amusement. The principal clubs are the Imperial yacht Club, the North German Regatta Club, and, of late years, the "Seefahrt" Club at Hamburg. A Society for the Promotion of the Technics of Ship-building was founded at the commencement of the present century and counts many professional men among its numbers. The fact of His Majesty having consented to become its patron proves to the world what importance Germany attaches to the development of the practical and scientific interests of ship-building.

XIV. Bullion and Credit, Stocks and Shares, Stock Exchange and Savings-banks.

A. Bullion.

Coinage.

The total value of coins of the Empire struck in accordance with the Acts dated December 4th 1871 and July 9th 1873, April 1st 1886 and June 1st 1900 to amend the Act of July 9th 1873, from the founding of the Empire up to the end of the financial year 1902/03, was 4,674 million marks. Of this amount, however, 89·7 million marks' worth had been withdrawn from circulation at the end of March 1903. The total amount in circulation at the end of March 1903 was made up of gold pieces amounting to 3,876·4 million marks, silver amounting to 621·9 million marks, nickel amounting to 70·3 million marks and copper amounting to 15·9 million marks. Besides the coinage of the Empire, the German "thaler" still passes as legal tender. The gradual withdrawal of these pieces from circulation was, however, decided upon by the Mint Act dated June 1st 1900, so that in about 10 years Germany will have a "pure gold" instead of an "imperfect" standard.

Paper money.

In addition to the mentioned specie there are 6,900,000 Imperial Bank notes of 5, 20 and 50 marks' value in circulation, amounting in all to 120 million marks.

Besides this there were in 1902—apart from 2·2 million marks worth of Brunswick notes, and notes of the provincial bank in Bautzen amounting to about 3 million marks, which were only current in a limited radius—notes issued throughout the Empire by the five authorized banks amounting to 1,371·2 million marks, made up of 100, 500, and 1,000 mark notes. Of this sum about 265·2 million marks' worth were in excess of the actual deposits of coin and bullion.

The amounts of legal tender in circulation for several years are given below, the totals being reckoned in millions of marks.

Year	Coins of the Empire									
	Gold	Percentage of amount in column 10	Silver	Percentage of amount in column 10	Nickel	Percentage of amount in column 10	Copper	Percentage of amount in column 10	Total amounts of columns 2, 4, 6, 8	Percentage
1	2	3	4	5	6	7	8	9	10	11
1880	1,746·6	78·73	427·1	19·25	35·2	1·59	9·6	0·43	2,218·5	100
1890	2,527·5	83·21	452·2	14·89	46·2	1·52	11·4	0·38	3,037·3	100
1900	3,687·2	85·47	543·7	12·60	68·0	1·57	15·7	0·36	4,314·6	100
1901	3,796·2	85·20	574·2	12·89	69·3	1·56	15·8	0·35	4,455·5	100
1902	3,876·5	84·56	621·9	13·56	70·3	1·53	15·9	0·35	4,584·6	100

Year	Thalers	Imp. Bank-notes	Bank-notes			Total legal tender				
	Total sum estimated	Total sum	Total	Unsecured	Percentage	Total of columns 10, 12, 13, 14	Percentages			
							Coins of the Empire	Thalers	Imperial Bank-notes	Bank-notes
1	12	13	14	15	16	17	18	19	20	21
1880	475	159·4	1,007·7	392·3	38·93	3,860·6	57·46	12·30	4·13	26·10
1890	450	122·9	1,197·0	276·8	23·12	4,807·2	63·18	9·36	2·56	24·90
1900	360*)	120·0	1,313·9	362·3	27·57	6,108·5	70·63	5·89	1·96	21·51
1901	330	120·0	1,345·4	294·4	21·88	6,250·9	71·21	5·28	1·92	21·52
1902	300	120·0	1,373·4	266·7	19·42	6,378·0	71·88	4·70	1·88	21·53

*) This great fall is due to the fact that with the continual increase of population of the German Empire a large proportion of thalers is being re-minted into coins of the Empire.

B. The Imperial Bank, and Banking generally.

Banking.

German banking may be divided into two groups,—the Imperial Bank and its branches, and the private joint stock banking establishments with theirs. Both these have made Berlin an authoritative financial centre.

Institution of the Imperial Bank.

The former commenced its career on January 1st, 1876, in succession to the Prussian Bank, after an agreement between Prussia and the German Empire had been signed on 17th/18th May, 1875 (provided for in the Bank Act of March 14th, 1875), referring to the transfer of the Prussian Bank. The original capital of the new bank amounted to 120 million marks. By the Act dated June 7th 1899 to amend the Bank Act, this capital was increased to 150 million marks on January 1st 1901 by the issue of 30,000 shares at 1,000 marks each. A further increase of capital to 180 million marks is looked forward to for January 1st 1905. The reserve funds on January 1st 1903 amounted to 47·5 million marks, and are to be increased to one-third of the original capital.

Capital of the Imperial Bank.

Branch establishments of the Imperial Bank.

On January 1st 1903 the Imperial Bank had under its direction the principal bank in Berlin, 18 chief branches, 61 smaller branches, 272 subordinate branches with counting-houses, 12 subordinate branches without counting-houses and 12 store-houses, making a total of 376 establishments as against 359 on January 1st 1902. The following table shows the development of the branch establishments during periods of 5 years.

At the beginning of the year	Independent Establishments			Subordinate Branches					Totals of columns 4 and 9
	Chief branches of the Imp. Bank	Smaller branches of Imp. Bank	Totals of columns 2 and 3	Larger subordinate branches of Imp. Bank	Subordinate branches of Imp. Bank with count.-house	Subordinate branches of Imp. Bank without count.-house	Store-houses of Imp. Bank	Totals of columns 5–8	
1	2	3	4	5	6	7	8	9	10
1876	8	44	52	4	99		27	130	182
1881	17	43	60	2	111	20	28	161	221
1886	17	44	61	2	115	19	22	158	219
1891	17	45	62	1	137	17	25	180	242
1896	17	47	64	1	177	13	20	211	275
1901	17	58	75	—	228	13	14	255	330
1902	18	61	79	—	253	12	14	279	358
1903	18	61	79	—	272	12	12	296	375

It is evident that, the Imperial Bank is continously adhering to its purpose of serving as a back-bone to the whole system of payments throughout

the country, and of uniformly effecting the equalisation of the system everywhere by its continually increasing extension to the smallest places. It is interesting to note that the almost uninterrupted increase in the total of branch establishments attained a quite unusual height in the period 1896 to 1901. At the same time the multiplication of the subordinate branches of the Imperial Bank which have counting-houses is also to be noted. As far as their business with the public is concerned they correspond to the independent establishments, and only differ in their organisation.

The amount of business transacted by these establishments is shown in the following table:

Comparative summary of business transacted by the Imperial Bank since its foundation.

Periods	Sums in millions of marks						
	Total turnover	Purchase of bills			Loans	Gold purchased	Deposit-account
		Local bills	provincial bills	Foreign bills			
1	2	3	4	5	6	7	8
1876–1880	45,626·6	1,078·1	2,553·1	34·6	590·7	90·2	27,333·9
1881–1885	63,950·2	1,138·0	2,622·2	53·2	831·3	71·4	44,785·5
1886–1890	89,809·2	1,430·1	2,868·3	70·4	907·2	127·7	67,064·7
1891–1895	111,492·3	1,882·1	3,217·0	64·1	1,021·1	134·2	83,947·7
1896–1900	161,145·8	2,873·3	4,496·8	106·5	1,514·2	102·0	117,928·1
1901	193,147·6	3,276·6	5,303·4	169·0	1,514·8	139·0	136,288·7
1902	191,926·2	3,068·8	4,368·7	180·4	1,499·8	29·2	135,468·6

Periods	Received and paid out to the account of the Empire and Federal States[1]	Nominal value of papers and documents handed to Imp. Bank to be taken charge of and supervised[2]	Total amounts dealt with at the different clearing houses[3]	Cost of administration	Net profit	Added to reserve funds	Dividends per cent declared[4]
1	9	10	11	12	13	14	15
1876–1880	1,821·9	664	—	5·4	9·7	0·8	5·94
1881–1885	2,119·1	1,245·2	8,887·5[5] / 12,130·1[6] / 12,554·4[7]	5·7	11·3	1·1	6·49
1886–1890	3,219·3	1,902·2	15,823·7	6·6	12·0	1·3	6·54
1891–1895	4,290·8	2,558·3	18,476·3	8·7	13·9	0·9[8]	6·72
1896–1900	19,626·5	2,821·4	26,957·8	11·1	24·9	—	9·07
1901	31,448·4	2,975·9	28,922·0	13·7	25·9	14·6[9]	6·25
1902	33,758·7	3,029·3	29,969·0	14·1	19·9	2·9	5·47

(Notes see following page.)

As can be seen from the above tables the Imperial Bank has made enormous strides. In 1876 the total turnover amounted to 36,7 milliard marks; in 1902 it reached 191·9 milliards, that is to say, in 27 years it increased by more than five times. The years from 1896 to 1900, in particular, show a rapid increase in all branches of the business compared with former years, an increase corresponding to the tension of all the economic forces of Germany taking place during that period. The one exception was in the purchase of gold. The amount of business done in this direction is not so much dependent upon economic conditions as upon international banking relations, the standard of value at the time, and the position of the money market. The circumstance that in spite of the existing crisis in banking circles the bank's business increased further in 1901 is due to the great reluctance to making advances shown by the other credit-advancing establishments, which had became very cautious on account of the collapse of certain large undertakings.

The total turnover since 1896 at the central office in Berlin and the 5 principal branch banks was as follows:

Year	Berlin	Hamburg	Frankfort, M.	Cologne	Leipsic	Breslau
1896	44,852·7	13,852·8	8,958·8	3,292·3	3,964·5	3,560·6
1900	59,904·2	16,375·5	10,742·2	6,492·1	4,927·4	6,810·6
1901	63,781·4	15,713·5	10,598·7	6,373·8	4,969·9	5,473·1
1902	67,087·5	15,502·9	10,296·3	6,091·4	5,363·0	4,998·6

Circulation of notes. The Bank Act of 1876 permitted a circulation of unsecured notes not subject to taxation up to the value of 385 million marks. Of this sum 250 million marks'

[1]) The enormous increase of receipts and payments is partly explained by the fact that more and more of the Federal States have connected their treasuries with the Imperial Bank.

[2]) Average quotation at end of year.

[3]) At the present moment there are 11 clearing houses.

[4]) The reduction of dividends was necessitated by a re-distribution of the profits. At the time of the foundation of the bank, for example, the State received 50 per cent of the profits remaining, after deducting the 4½ per cent ordinary dividends for the shareholders and a sum of 20 per cent for transference to the reserve funds, and also 75 per cent of any balance still remaining. To-day the State receives 75 per cent of any balance remaining after paying a dividend of 3½ per cent to the shareholders and transferring a sum of 20 per cent of the balance to the reserve funds.

[5]) Actual figures reached December 1883.

[6]) Actual figures for the year 1884.

[7]) Actual figures for the year 1885.

[8]) Actual figures for the year 1891, in which the prescribed limit of 30 million marks for the reserve funds was reached. The fact that further additions have been made to the reserve funds since 1901 is owing to the Bank Act of June 7th, 1899.

[9]) This unusual figure is explained by the fact that the sum of 10,500,000 marks paid on application for shares was placed to the reserve funds in accordance with § 2 of the Act of July 7th, 1899.

worth were issued by the Imperial Bank and the remainder by the other 32 private banks in Germany which are allowed to issue notes. By the year 1899, 25 of these establishments had renounced their rights to issue notes, and their business fell to the Imperial Bank. The Bank Regulations of 1899 raised the limit of notes, free of tax and unsecured, to 541·6 million marks, of which 450 million marks' worth were allotted to the Imperial Bank.

In 1900 and 1901 two banks renounced their rights to issue notes, and the present total of notes issued by the Imperial Bank now amounts to 470 million marks. The average totals of Imperial bank-notes in circulation for the years 1896–1902 were: 1,085·7 million marks in 1897; 1,124·5 million marks in 1898; 1,141·7 million marks in 1899; 1,190·2 million marks in 1901; 1,229·6 million marks in 1902.

Notes issued by private banks.

The five private banks which still issue notes-work with a total original capital of 66 million marks. The percentage of dividends paid were as follows:

Year	Percentage				
	Baden Bank	Bavarian Note Bank	Brunswick Bank	Bank of Saxony in Dresden	Wurtemberg Note Bank
1896–1900	6 11/30	8 1/2	5 5/6	7 1/30	5 3/4
1901	5	8	5 2/3	4	5
1902	5	7	5 1/2	5	4 1/4

Circulation of notes.

The average value of private bank-notes in circulation in 1902 amounted to 143·8 million marks; of this amount 55·3 million marks' worth were unsecured. Their remaining daily liabilities amounted to an average sum of 60·2 million marks in the same year. With the exception of the Brunswick Bank and the Provincial Bank in Bautzen, these banks have placed themselves under the Bank Act, and are consequently, like the Imperial Bank, subject to the restrictions it imposes on the carrying on of their business. Each of these banks, therefore, can only transact business of the following nature:—Traffic in Gold and Silver, bills of exchange, loans, certain kinds of promissory notes, receiving and paying out money, buying and selling stocks and shares for clients, receiving money for deposit and current accounts, taking charge of and attending to valuables.

Business sphere of the Imperial Bank and other note-issuing banks.

Deposit and stock and share banks.

The other large German banks are on a different footing. They are governed merely by the general provisions of the commercial code, the Stocks Shares and Exchange Act, and the Deposits Act of 1896, and have developed a peculiar position in the management of their business, and one which, apart from the issuing of notes, is quite unrestricted. In many cases they include

branches of banking which in other countries are kept distinct, such as deposit banks, banks for capitalising commercial enterprises, and stock-broking business. The most important among them, following the example of the Imperial Bank, have established a system of branches and other subordinate connections; they have even founded independent branches in foreign countries, and have become enormous undertakings of the very first importance.

The following joint-stock banks are the most noteworthy both for size and importance. In 1902 there were 122 German deposit and share-issuing banks, each with a share-capital of over a million marks or transacting business amounting to that amount, and showing at the end of the year assets amounting to 7,085 million marks. The increase of capital in 1902 amounted to 441·7 million marks. Their own capital was made up in shares to the value of 1,980 million marks and in reserve funds amounting to 391 million marks (19·7 per cent of the share-capital). Other capital to the extent of 3,380 million marks was entrusted to them by creditors and customers. Upon their files were acceptances to the value of 1,176·5 million marks. Their total liabilities, including their clear profits, amounted to 4,713 million marks, against which there stood at their immediate disposal the sum of 3,398 million marks, (in specie, bills, loans, shares, &c.),—i. e. 72·4 per cent of their total liabilities.—The gross profits of the banks for 1902 amounted to 256·76 million marks. The net profits figured at 156·17 million marks. The average dividend paid upon the share-capital was 6·19 per cent.

The state of the joint stock banks not issuing notes (with an original capital of at least one million marks).

Year	Number	Own capital	Reserve	Other assets (Credits and deposits)	Liabilities, including net profit	Disposable assets*)	Gross profit	Net profit	Average percentage of dividends
		Million marks							
1896	98	4,215	235	1,868	2,739	2,011	159	118	7·66
1900	118	6,958	391	3,128	4,608	3,243	263	185	7·19
1901	125	6,643	380	3,015	4,304	3,157	258	153	5·66
1902	122	7,085	391	3,380	4,713	3,398	257	156	6·19

Tendency towards concentration.

The development of German banks due to natural conditions and legislation has more recently manifested itself in a tendency towards concentration. This is evident from the following summary:

*) Such means as cash, bills, deposits, securities, &c., which are generally considered easy of realisation.

	Number possessing at				
	Imperial Bank offices	Banking establishments	Bank branches	Bankers	Bankers branches
1876	62	97	33	974	—
1896	254	163	82	1,473	2
1900	321	223	190	1,489	7
1902	358	230	229	1,492	12

The number of offices of the Imperial Bank increased therefore six times, the number of banks by 237 per cent, their branches by 700 per cent, the number of bankers (including their branches) by only 154 per cent. The development of the figures of the distribution of capital and turnover is still more evident.

Berlin and provincial banks.

Of those of the more important banks whose expansion has been most rapid, ten belong to Berlin; they are followed by twenty-two provincial banks in no way connected with the former as far as concerns organisation; their development however cannot be compared with those of Berlin.

	10 Berlin banks			22 provincial banks		
	Own capital	Capital belonging to other persons	Total capital engaged	Own capital	Capital belonging to other persons	Total capital engaged
	million marks					
1886	418·8	502·9	921·8	114·9	161·2	276·1
1896	777·5	942·8	1,720·2	141·0	201·0	342·0
1900	1,111·8	1,486·4	2,598·2	185·9	278·2	464·2
1902	1,184·8	1,812·9	2,997·7	191·6	275·7	467·3

Whilst the capital belonging to the Berlin banks therefore almost trebled itself during 17 years, and the amount of the capital entrusted to by them other persons was almost four times as much, the same items in provincial banks only increased by about 66 per cent and 100 per cent respectively.

The growing influence possessed by these ten banks is evident from the fact that they possessed:

	Establishments and branches	Deposit offices and exchange offices	Constant participation in joint stock banks	Branches of business	Total
1896	22	32	2	13	69
1902	40	115	16	14	185

Position of eleven Berlin Banks.

In 1902 there were 11 Berlin banks each with a share-capital of more than 30 million marks, a total nominal share-capital of 995 million marks, and reserve funds

amounting to 235·2 million marks. Their acceptances in circulation amounted to 692 million marks. Their liabilities, inclusive of clear profits, were 2,669 million marks, whilst the assets at their disposal figured at 2,016 million marks, i. e., nearly 76 per cent, making a 4 per cent higher security than for the total of the banks in question. This small number of banks had very great influence in consequence of the enormous means at their disposal, about 1/7 of the total bank capital of Germany and more than 50 per cent of all the capital administered by banks being at their disposal, and their branches being distributed over the whole country. They declared on an average a dividend of 6 per cent, making a total of 65 million marks.

Large provincial banks.

Besides these 11 great Berlin banks there are seven other banks in the Empire each with a capital of at least 30 million marks, and in addition to these the banks of particular branches of business such as stocks and shares, and in particular two of the largest real-estate banks (one in Munich and the other in Leipsic).

Banks doing brokers' business.

The unsworn brokers who frequent the Stock Exchange as middlemen have combined, partly at any rate, to form a common society with a view to obtaining certain advantages in effecting transactions of large proportions and increasing their business credit. The most prominent amongst these are the two broker banks in Berlin, which had 38 members in 1902 and a capital each of 3 million marks with a total reserve of 1·2 million marks—and the Hamburg broker Bank, with 56 members and a capital of 1 1/2 million marks. The first two showed profits for 1902 amounting to about 360,000 marks. The turnover in Berlin fell from 3·4 milliard marks in 1893 and 3·7 milliard marks in 1895 to 1·7 milliard marks; in Hamburg it sunk from 0·9 and 0·7 milliard marks respectively to 0·25 milliards.

Clearing business and the Berlin "Kassenverein" Bank.

For large payments, the most important business is transacted by the clearing and bill-broking department of the Imperial Bank. Besides this, however, the Berlin banks and others make use of a special institution the "Berliner Kassenverein" founded by themselves, for clearing and collecting bills. The total turnover of this institution for 1902 amounted to 35·9 milliard marks, which sum was equally divided between bill and check transactions, 92·11 per cent of it being settled in the institution itself. The encashment business on acceptances, invoices, and accounts collected for customers reached a total of 13·9 milliard marks. Special liquidation and clearing houses for transactions in stocks and shares also exist in Berlin, Frankfort-on-the-Main, Hamburg and Breslau.

The clearings of payments within the larger banks themselves,—which are growing constantly in consequence of the rapid spread of separate enterprises throughout the country, through their branches and other affiliated concerns,—cannot be elicited. It is therefore impossible to give a summary of the total transactions in payments within the German Empire.

Private banks. It is just as difficult to estimate in figures the transactions of the German private banking institutions. About a dozen of these latter are little if at all behind the great joint stock banks in the amount of business done, whilst the smaller private banks are of comparatively less importance, as has been shown but, number nevertheless many hundreds.

German banks abroad. Among German banking establishments a comparatively small fraction are beyond the seas and have been established formed by the four daughter concerns of the larger Berlin and Hamburg joint stock banks with a total capital of 55 million marks; 11 establishments exist in South America, India, and Eastern Asia, as well as numberless private German banks, some of which are quite independent of home establishments, and which transact their business partly in Germany and partly abroad.

Special institutions advancing credit on estate. In addition to the banks formed to meet the requirements of floating capital, it is equally interesting to note the development in Germany of institutions the object of which is to procure credit for the proprietors of non-transferable or real estate. Such institutions are the Mortgage Banks, the Land-mortgage Banks and "Landschaften" (Country banks).

Mortgage banks. In 1902 there were 39 mortgage banks transacting business in Germany with a share-capital of 640·9 million marks and reserve funds of 242·5 million marks. They have mortgage bonds in circulation to the value of 7,026 million marks. More than half of these were issued at less than 4 per cent, 3,083 million marks' worth at 4 per cent and only 7·2 million marks at a higher percentage. The total amount of loans made by all these banks amounted in 1902 to 7,440·4 million marks, and consisted almost entirely of town and municipal mortgages and loans, scarcely one-eighth being for mortgages on land. The clear profit of the mortgage business and other branches amounted in 1902 to 63·2 million marks; the sum paid in dividends was 46·3 million marks, making an average of 7 1/2 per cent.

Development of Mortgage Banks since 1896.
(Totals in millions of marks.)

Year	Number of banks	Capital	Reserve funds	Mortgage bonds in circulation	Loans	Net profits	Percentage of average dividends
1896	40	493·7	123·7	5,293·2	5,614·0	63·66	7·96
1900	39	582·6	189·1	6,504·5	6,888·2	63·22	7·67
1901	39	628·9*)	226·6*)	6,715·0	7,100·7	62·16	7·08
1902	39	640·9	242·6	7,026·0	7,440·4	63·2	7·3

*) This great increase is due to the wholesale deferments which were rendered necessary by the crisis in 1900/01.

Up to the year 1899 the lucrativeness of the banking business increased steadily with only one exception. In 1900 certain banks passed through a severe crisis which led in some cases to serious consequences, and a sifting out of unsound institutions. Since 1902, however, the results of this crisis have been to a great extent made good.

Provincial state credit-advancing institutions.

In addition to the above-mentioned 7 milliard marks in mortgage bonds on town property, comes the further sum of 3 milliard marks mortgages principally on landed estate procured by other credit-advancing institutions. These are partly old-established concerns of semi officiat character dating back to the 18th century. The 12 credit-advancing institutions of this character which exist to-day, together with the central Prussian provincial institution, serve, with one exception, the interests of the great landed proprietors, and have advanced loans to the value of 2 1/3 milliard marks. Of a similar nature to these institutions, but operating in a restricted field, is the Berlin municipal mortgage institution, which has mortgage deeds in circulation to a value of more than 200 million marks. There are further 15 other so-called country banks or banks advancing credit on landed estate, and having state, communal or provincial liability, which have advanced a total sum of over 550 million marks in mortgage bonds and more than 235 million marks in corporation loans. Three of these institutions, certainly, procured their working capital through provincial or state debt bonds. The total sum of securities in circulation amounted to about 750 million marks. The remaining capital necessary for the loans advanced was procured principally by the addition of the paid up capital amounting to over 100 million marks.

Co-operative credit-advancing institutions.

Besides these two principal systems of procuring credit there exist in Germany a number of co-operative societies for advancing loans, principally for agricultural purposes but also for other branches of industry (see p. 90, &c.).

C. Stocks and Shares.

Statistics of shares, &c.

According to the estimates of the "Deutscher Ökonomist," shares have been issued in Germany to the value of 20–25 milliard marks during the period 1887–1902. One-third of the annual increase of property of the German population, which has been estimated at 6 milliard marks, is to-day laid out in stocks and shares. Roughly speaking about a quarter of the capital property of Germany is employed on the stock exchange. During the last 15 years the amount of German capital invested in foreign loans, exclusive of outlays in banking and industrial shares, was over 6 milliard marks. Between 2/3 and 3/4 of the profits on German capital invested fell to the share of the home money-market and inland enterprise, and—apart from municipal and state loans and the mortgage broking business, was invested chiefly in bank and industrial shares.

The demand for foreign shares makes it more difficult to form an idea as to the amount of capital invested in current foreign loans and undertakings to-day than formerly, because, since the Stock Exchange Act came into force, a perpetually increasing percentage of capital invested in foreign shares is offered on foreign markets. Of the first importance in this respect is the London Stock market, and then those of Brussels, Amsterdam and New York.

In Germany the following amounts were suscribed for new concerns, loans, &c.:

Issue of shares during 1896–1902 in million marks, at current rate of exchange.

	Average 1896–1900		1901		1902	
	German	Foreign	German	Foreign	German	Foreign
State loans	167·56	186.02	505·57	29·26	536·40	339·00
Municipal loans	166·30	23·77	293·58	12·86	196·13	61·22
Mortgage deeds	396·55	44·76	210·50	7·16	350·00	6·16
Railway bonds	42·00	170·25	14·81	148·93	8·71	29·30
Industrial bonds	99·34	10·57	193·23	0·97	158·10	3·20
Railway shares	25·97	21·94	3·02	—	48·01	6·68
Bank shares	260·57	10·86	36·26	9·00	114·33	7·43
Insurance shares	0·70 *)	—	—	—	—	—
Industrial shares	498·91	15·64	164·28	1·85	184·47	0·51
Total at rate of exchange	1,657·90	484·00	1,421·31	210·03	1,596·15	453·50
Nominal amount	1,407·81	521·64	1,412·73	225·83	1,586·66	481·86

During the years 1896–1900, when the boom was at its highest, an enormous rise took place in the number of shares issued for banking and industrial purposes, accompanied by a corresponding rise in premiums never reached before, an average namely of 67–69 per cent for shares in industrial enterprise, and 40 per cent for banking shares. The commencement of the crisis then made itself distinctly felt. The number of shares issued in 1901 was an unusually small one. In 1902 these was evidence of a decided improvement, as proved by the business results of the banks. In spite of this, however, during the year 1902 banking and industrial shares of a nominal value of about 195 million marks were put on the market at a price of 299 million marks.



Imperial stamps upon securities.

The double and partly contradictory effect of the boom on the one hand and of the new Stock Exchange Act on the other,—serving as it did to make stock exchange business more difficult—followed by the increased cost of the Imperial stamp duty and later by the crisis, is to a certain extent reflected in the figures showing the proceeds from Imperial stamp duties on securities.

*) Only issued in 1896 for 3·48 million marks, current rate of exchange.

Proceeds from Imperial stamp duties upon securities.*)

Average of the years	Stock and Share stamps	Stamps on transfers
	million marks	
1881/82–1885/86	4·1	2·7
1886/87–1890/91	6.5	11·3
1891/92–1895/96	7·4	13·0
1896/97–1900/01	17·5	14·0
1901/02	14·5	13·4
1902/03	21·3	13·6

A decrease in business transacted is found to go hand in hand with the recent increase in stamp duties.

Joint-stock companies.

The total number of German joint-stock companies in the middle of 1903 was estimated at over 6,000. For 5,500 companies a paid-up share-capital of 9·8 milliard marks could be proved, to which 1·5 milliard preference debentures must be added. The reserve funds were on the average estimated at a sixth of the share and debenture capital. 85 companies date back to before 1850, though the activity in founding companies only commenced after the establishment of the Empire. Out of about 4,000 joint-stock companies whose date of foundation could be ascertained, more than 2,500 were started between the years 1890 and 1900.

Activity in company-forming.

The activity shown in forming companies during the last few years is divided by the crisis of 1900 into two parts, a boom and a period of quiet. Up to 1900 this activity was directed with great energy to the foundation of new companies, and also, hardly less to the increasing of capitals, and the conversion of separate existing firms and open commercial companies into joint-stock companies. Special establishments similar to the English "Trust-banks" were founded for this latter object in certain industries.

Summary of promotions. (Amount in millions of marks.)

Year	Total number of promotions			Divided amongst							
				Industry, Building Mining, Agriculture, Cattle, Breeding				Banks			
	Number of joint-stock companies	Share-capital									
		Total	Average for every company	Number	Percentage of col. 2	Capital	Percentage of col. 2	Number	Percentage of col. 2	Capital	Percentage of col. 3
1	2	3	4	5	6	7	8	9	10	11	12
1896	172	268·6	1·5	123	71·51	172·6	64·26	13	7·56	37·0	13·78
1898	329	463·5	1·4	248	75·38	289·1	62·37	17	5·17	62·6	13·51
1900	261	340·4	1·3	219	83·91	282·9	83·11	5	1·92	6·1	1·79
1902	87	118·4	1·4	66	75·86	98·7	83·36	2	2·30	2·2	1·86

*) It must be borne in mind that the stock exchange tax was raised in 1885, 1894 and 1900.

Year	Divided amongst											
	Insurance companies				Railways and other means of communication				Various			
	Number	Percentage of col. 2	Capital	Percentage of col. 3	Number	Percentage of col. 2	Capital	Percentage of col. 3	Number	Percentage of col. 2	Capital	Percentage of col. 3
1	13	14	15	16	17	18	19	20	21	22	23	24
1896	1	0·58	3·3	1·23	17	9·88	37·7	14·04	18	10·47	18·0	6·70
1898	1	0·30	2·0	0·43	33	10·03	86·4	18·64	30	9·12	23·4	5·05
1900	—	—	—	—	19	7·28	40·0	11·75	18	6·90	11·4	3·35
1902	—	—	—	—	10	11·49	9·9	8·36	9	10·34	7·6	6·42

Distribution among the industries.

This activity in the foundation of companies was particularly marked in the building and smelting industries, more than 3/4 of all the new companies formed between 1896 and 1899 being connected with these branches of industry. The subdivisions within this group in which the development was most noticeable were the branches of metal working and machine construction. Five or six of every thousand companies formed came under this category, and if electrical companies are included, far more than a quarter of the new companies formed will be included in the group. A further sixth fell to the share of the industries for the preparation of food and drink, about 100 breweries alone being founded as joint-stock companies. There was also a spirit of activity strongly in evidence in the quarrying and kindred industries, the textile industry and railway construction. In banking, too, such activity was also prominent, but was less shown in the number of new banks founded as in the amount of capital invested. One-seventh of the total capital invested in newly formed companies was devoted to the metal working industry and machine construction, while the electrical branch alone claimed 50 million marks annually on an average. Railways and other carrying and traffic-forwarding concerns absorbed one-tenth of the total capital invested in shares.

Spread of joint-stock companies.

Nearly 9/10ths of the joint-stock companies at present existing are in the industries, the building and smelting businesses. The rest, apart from about 150 Assurance companies, are divided amongst banks and other credit institutions. The proportions as regards capital are however quite different; fully a third of the capital invested in shares and debentures being engaged in banks and assurance companies.

In 1896 about one-seventh of the existing joint-stock companies had a capital of less than 100,000 marks, and another seventh between 100,000 and 250,000 marks. More than half the total number had capitals of

between 250,000 and 2½ million marks. One-tenth of the total number had capitals of between 2½ and 10 million marks, and a little over a hundred companies exceeded this figure. Since then the number of larger companies has considerably increased. Yet of the 5,500 joint-stock companies whose figures we quote the capital (including debentures) still averages 2·05 million marks. The estimated average capital for all existing joint-stock companies is 1·35 million marks.

Business profits. There have been no new statistics elicited as to the net profits of all existing joint-stock companies, nor as to the dividend paid. In the following table those companies are included whose shares are or have been quoted on the Berlin Stock-Exchange.

Summary of business proceeds of joint-stock companies registered at the Berlin Stock-Exchange.

Year	Number	Share capital in million marks	Dividends paid	
			Totals in million marks	Per cent
1875	330	3,178·8	135·93	5·31
1880	430	3,225·4	146·55	5·20
1885	501	2,819·3*)	141·79	6·28
1890	605	3,802·0	271·63	8·61
1895	680	4,131·0	267·01	8·60
1900	930	6,676·9	539·54	9·41

From this table some idea of the conditions prevailing may be gained; for not only is the number of companies very large, representing more than two thirds of all German capital actively invested, but the above figures are also proportionately in agreement with the statistics relating to various professions for the year 1895.

D. Stock and other Exchanges.

Number of Exchanges. During the last century the number and importance of the Exchanges have considerably increased, and they have not only become the means of judging the standard of credit, of effecting transactions in bonds and securities, but they also guard and regulate most minutely all the above mentioned undertakings as well as their credit value. There are 30 exchanges in Germany to-day, 17 in Prussia, 2 in Bavaria, 4 in Saxony, 1 in Wurtemberg, 1 in Baden, 2 in Alsace-Lorraine (as well as a Wine-Exchange in Colmar) and 1 in each of the three Hanseatic towns.

*) This number is not accurate, as the share-capital of 30 Fire-assurance companies could not be elicited, and is therefore not included.

The only Exchanges whose influence extends beyond their own local or particular sphere, and which effect the money-market in general, are those of Berlin, Hamburg and Frankfort o. M. The importance of the remainder is either a purely local one or makes itself felt only in particular securities and kinds of goods.

The number of persons attending the Exchanges is shown in the following table:

	Berlin	Bremen	Breslau	Dresden	Frankfort o. M.	Hamburg*)	Cologne	Leipsic	Munich	Stuttgart
1896	2,876	1,355	384	45	659	—	294	557	95	77
1900	3,025	1,345	308	44	580	—	—	519	85	74
1902	2,912	1,343	256	45	523	—	393	468	90	69

Stocks and Shares. More than half the above mentioned Exchanges are both Stock and Produce Exchanges, about one-tenth being exclusively Stock-Exchanges, and the remainder exclusively Produce Exchanges. The Berlin Stock-Exchange list quotes about 2,150 stocks and shares, principally German and foreign securities and state loans, bonds, railway debentures and securities and bank shares, as well as many industrial shares. The Frankfort Exchange list, which influences the whole of South Germany, quotes about 1,100, and the Hamburg Exchange about 600 stocks and shares.

The following table shows the number of new stocks and shares admitted to German markets:

		1897	1898	1899	1900	1901	1902
		Totals in million marks					
Home Stocks and Shares	Total value	3,788	2,093	2,298·1	2,423·4	2,366	2,748
	Proportion converted	—**)	163	126	127	25	645
Foreign Stocks and Shares	Total value	890	2,534	1,504·4	448	778	2,632
	Proportion converted	—**)	782	647	8	12	1,171

Position of the Hamburg and Bremen Exchanges. The principal position in the produce market is held by the Hamburg Exchange. An enormous international trade takes place there, the most important articles being coffee and sugar, the general goods trade as well as the settlement of freights and the marine insurances. The Bremen Exchange is chiefly of importance for the tobacco and cotton trades. Leipsic is the centre of the textile industry and at the same time the seat of the German book-selling business, whilst Essen is the market for mining shares, &c.

*) The number for Hamburg amounts to many thousands, but cannot be ascertained exactly, as the Exchange is open to everybody.

**) Only the total value of conversions effected in home and foreign stocks and shares can be ascertained for 1897, the amount being 1,400 million marks.

German Exchange business for foreigners.

The Exchanges of Germany play an important part in foreign undertakings and arbitrations. These transactions are heavily burdened by legislation and stamp duties, though the latter have been partially remitted. The total sum for 1893/95 amounted to 111,000 marks, but dropped in 1902/3 to 55,000 marks owing to a falling-off in business.

German Stock-Exchange business abroad.

The participation of German capital in foreign stock markets is increasing on the other hand. At the end of 1893, 167 German banks and bankers had securities amounting to 290·3 million marks deposited abroad for their own account or on behalf of their customers. At the end of 1903 the sum had reached 1,002·4 million marks.

E. Savings-Banks.

See p. 39.

XV. Insurance affairs.

Branches.

Insurance affairs have reached a higher state of development in Germany than in any other country, and have been helped forward both by private initiative and by the state. They include the most varied spheres of operations in industrial life, and are furthermore growing into one of the weightiest factors of social politics, a factor which aims at improving the social condition of millions of persons. Starting from the oldest branches of marine and fire assurance, expansion has taken place in various other directions,—insurance against damage by hail, storm or water, insurance of goods in transport, of glass and cattle, against sickness and accident, for dowries, military service and risks of war. The complex many-sidedness of modern life and the growing need for security against contingencies of every kind have occasioned the institution of insurance against theft and burglary, against business risks and losses, for the redemption of bonds and against the falling in value of securities, as well as insurance for guarantees, credit and liabilities and the insurance of bicycles. This protective system was crowned by the mission inaugurated by H. M. Emperor William I. on November 17th 1881, and continued by H. M. Emperor William II. on February 4th 1890, for a continual social insurance, a system which is gradually and steadily being extended to further classes of the public.

Insurance by the State.

Private Insurance.

On May 12th, 1901, an Imperial Act dealing with private assurance undertakings came into effect, providing for the establishment of an office for inspection of private insurance concerns. Its object is to protect and supervise the insurance business of Germany.

Insurance of persons.

In 1901 there were 27 joint-stock companies and 30 mutual insurance companies doing business privately in Germany as life-insurance companies. These 57 companies had issued at the end of 1901 nearly 6 million (5,998,374)

Life insurance.

policies in their various branch establishments, amounting to a total assurance of 8·3 milliard marks. The average sum assured per person was about 1,400 marks. In the year 1901 the premiums paid amounted to 358·5 million marks. The development of this branch of insurance business is constantly on the increase.

Sums in million marks.

Year	Number of companies	Amounts assured	Premiums paid
1880	47	2,281·99	78·04
1890	56	4,311·51	164·10
1896	60	6,266·12	260·82
1897	60	6,731·58	283·76
1898	59	7,182·43	306·82
1899	59	7,601·68	323·10
1900	58	7,999·96	341·17
1901	57	8,347·64	358·51

48 of the companies dealing with insurance in case of death issued policies to the number of 1,478,936 and amounting to 6,094·10 million marks. 525,000 of this number were death policies amounting to 2,240 million marks (or 26·6 per cent of the total sum), and the rest were tontine insurance.

33 companies undertook burial insurances or insurances for the working classes in case of death, and at the end of 1901 had issued 3,942,963 policies, amounting in value to 748·3 million marks. The claims paid in 1901 amounted to 94·3 million marks.

Dowry and military service.

48 companies for dowry insurance issued 321,982 policies for survivorship covering a sum of 598·6 million marks; and 7 companies issued policies against military service to the number of 254,493, amounting to 306·7 million marks. The annuities amounted to 46 million marks.

Annuity insurances.

In 1901 annuities were issued by thirty-five companies. At the close of the year 53,464 policies were in force, covering 17·09 million marks in running annuities, and 2·17 million marks in deferred annuities. There were, moreover, 1,280 policies covering 1·6 million marks in annuities for sick persons, and 815 policies for

invalidity annuities, amounting to 0·5 million marks. The average amount of each annuity insured was 360 marks.

Besides this, 5 companies had tontines amounting in all to 76·4 million marks with as many as 76,964 persons insured.

Insurance against accident.

The insurance of human life forms the object of 28 accident assurance companies, which, like most of those already enumerated, do not confine themselves to one branch of business, but, with a view to the promotion of wider and more secure business operations, have added sundry kindred branches of insurance to their field of activity. Nearly all in addition to accident insurance give some attention to liability and guarantee insurance. In 1901 their receipts in premium and fees amounted to 48·6 million marks, while the sum paid in replacing losses was 15·9 million marks, the total surplus remaining being 6·75 million marks.

Property insurance.

While these companies confined themselves chiefly to the insurance of human life, by far the greater number were directing their attention to the insurance of property against risks.

Fire insurance.

The foremost position was held by the fire insurance business. Here the State and the Municipalities have taken the lead in establishing insurance offices. At present 345 public and private insurance offices exist, 29 of which are joint-stock companies; the remainder are mutual insurance establishments and are made up of 57 public societies, 242 Prussian fire insurance associations of restricted field, and 17 large private mutual companies.

Joint-stock companies.

The most important division at the present day is formed by the joint-stock companies, which claim 55 per cent of the total property insured, or 78·7 million marks. The increase in business during the last 10 years amounted to 26·5 million marks. The receipts in premiums for the year 1901 amounted to 164 million marks, whilst claims paid and cost of collecting amounted to 55·4 million marks. The share-capital employed amounted to 160 million marks, and the reserve funds to 49·3 million marks.

Societies.

The societies showed in 1900 insurances to the amount of 49·7 milliard marks, consisting of 45·2 milliard marks for the insurance of real estate, and 4·5 milliard marks for portable property. The receipts (including 66·8 million marks in premiums) amounted to 77·2 million marks, whilst the expenses totalled 74·4 million marks including 2·8 million for fire-extinguishing apparatus*) leaving a surplus of 2·9 million marks.

Mutual insurance companies.

The 17 mutual fire insurance combines insured property to the value of 11·6 milliard marks in 1901. Their receipts from premiums amounted to 29·5 million marks, while their expenses in claims and collecting reached 7·5 million marks.

*) The total amount expended in this direction during the last quarter of the past century was 65 million marks.

Summary showing the development of fire insurance offices.
(Sums in million marks.)

Year	Societies			Joint-Stock Companies			Mutual assurance Companies		
	Number	Sums insured	Premiums paid	Number	Sums insured	Premiums paid	Number	Sums insured	Premiums paid
1	2	3	4	5	6	7	8	9	10
1890	57	35,706·0	47·0	30	50,505·7	103·1	19	8,127·2	21·9
1895	57	41,931·3	60·0	29	60,959·5	123·3	19	9,704·9	25·1
1899	57	47,829·9	66·8	30	74,279·7	164·3	17	11,025·0	28·3
1900	57	49,677·1	64·7	29	77,097·3	167·2	17	11,328·3	28·9
1901	57	?	?	29	78,692·0	164·0	17	11,624·9	29·5

Traffic insurance. The insurance of goods in transport has assumed almost equal dimensions with that of the fire-insurance business. In 1901 there were 47 large companies and a considerable number of smaller offices and private firms for the insurance of goods in transport, the majority of which were working on a mutual system. The principal portion of the business, however, fell to the share of the joint-stock companies. These collected premiums to the value of 108·4 million marks, out of which a surplus of 2·4 million marks remained. The sums paid in claims amounted to 44·7 million marks. 40 companies represented a paid-up share-capital of 20·7 million marks, and 76·3 million marks in shareholder's securities. The greater part of the entire business was of course done in marine insurance; the 12 Hamburg companies, for instance, insured property in this branch alone amounting to 5 milliard marks.

Cattle insurance. Another important field for the insurance business is found in agricultural crops, cattle and stock. The insurance of live-stock and crops against damage by hail appeals chiefly to persons engaged in agriculture. It is principally carried on by means of co-operative associations, there being at the present moment more than 6,500 societies for the insurance of live-stock scattered over the Empire. Various German governments are trying to establish agricultural insurance offices, which will be supported by the local societies, and will in turn guarantee them insurance. In Bavaria, for instance, there is the "Bavarian Agricultural Insurance Office," which at the end of the year 1901 included 1,551 societies and a total of 74,030 members. The importance of the private insurance business is also shown by the magnitude of the sums insured in 24 of the largest live-stock insurance companies,—356·7 million marks for the year 1901 premiums being paid to the value of 8·1 million marks, and 5·1 million marks in claims.

Insurance against damage by hail. There are 5 joint-stock companies which undertake insurance against damage by hail. In 1901 these companies insured property to the value of nearly

1 milliard marks (961·4 million); their premiums amounted to 9·1 million marks, and the total of claims paid for damage sustained totalled 5·8 million marks. There are also 12 mutual insurance offices with a general organisation extended over the whole Empire, and 5 other such companies working with either a locally or a materially restricted field of activity. The former insured property to the value of 1,321·1 million marks, the premiums paid amounting to 14·1 million marks, and the total sum paid out in claims for damages reaching 11·2 million marks; the latter insured property to a value of 319·4 million marks, their premiums amounting to 3·8 million marks, and their expenses (including claims paid up and estimate making) to 3·5 million marks.

Insurance of glass. The insurance of glass is closely connected with the insurance against damage by hail. Exact statistics for this branch of insurance cannot be elicited, because a large number of the fire insurance offices also make a business of insuring glass, and have no separate statement of figures upon this particular matter. The following are the results declared by 9 offices doing business exclusively in glass insurance, and by 11 other businesses which publish particulars upon this branch of their business:—the whole 20 companies commanded at the end of 1901 a paid-up capital of 381,000 marks and 395,000 marks reserve funds, 1 million marks in cash and at the bank, and 2·6 million marks in mortgages and landed property. The total amount of premiums paid was 3·6 million marks, the expenses in claims for damages amounted to 3·1 million, leaving a total surplus of 163,000 marks.

Re-insurance. The tremendous claims, sometimes coming in bursts, which are made upon the fire, transport, and damage by hail insurance companies make it absolutely necessary for the larger offices to secure themselves by means of re-insurance. 35 joint-stock companies exist (with a capital of over 110 million marks) whose business is partly or entirely devoted to re-insuring or sharing the risk of insurance. Their premiums and fees for 1901 amounted to 214·1 million marks, and their expenses arising from claims paid alone to 90·9 million marks. The total profits figured at 5·2 million marks.

New branches of insurance business. There are finally a number of other branches of insurance which have only been lately created and are not at present of very great importance though taken up by the above mentioned companies. Amongst these must be mentioned, for instance, the rapid development of insurance against burglary. In 1901 there were 19 companies undertaking this branch of insurance; their premiums amounted to 2·5 million marks, and they paid out as much as 343,000 marks in claims. 2 companies may also be mentioned which, with a capital of 2 million marks, exclusively undertook insurance against damage occasioned by water mains, whilst the greater part of the above-mentioned companies, particularly the fire insurance companies, undertook this as a subordinate branch of insurance.

Lucrativeness of private insurance undertakings.

The following table of figures*) showing the business results of the above-mentioned joint-stock insurance companies, gives some idea of the lucrativeness of this branch of business:

	1. Total Surplus		2. Surplus from Premiums	
	Year	Total (million marks)	Percentage of total of premiums	
	1890	70·32	12·0	
	1895	81·28	8·7	
	1900	108·42	9·6	
	1901	129·74	11·3	

Foreign companies.

Besides the German companies there are a number of foreign insurance companies doing business in the German Empire. Their admission to the Empire is dependent upon permission granted by the Imperial Chancellor after they have been reported on by the department for the supervision of insurance business. This permission has up to the present been granted to 22 life, 8 fire, 8 accident and liability insurance and 6 transport insurance companies of considerable size, principally of Austrian, Swiss, English and American nationality.

It must always be kept in mind that all the figures given above only contain the amount of risk-securities insured by German companies, for it is not possible to ascertain exactly what share foreign companies claim, nor to ascertain the amount of assurance business undertaken by German companies abroad.

XVI. Imperial Social Insurance.

See special article.

XVII. Unions and Associations.

A. Unions and Leagues.

Side by side with the individualism which permits every person to follow his own bent, there exists in German intellectual and industrial life a strong tendency towards union for the promotion of common ends. This tendency has been active for divers purposes from times immemorial, and to-day there is no branch of social, scientific or intellectual life which has not been affected by its influence.

*) These figures cannot of course include all companies; the number of those omitted is, however, inconsiderable, so that the figures give a fairly correct idea.

Religious Societies. The first group under this heading is formed principally or exclusively by societies of a religious or scientific nature, and other societies serving for the furtherance of knowledge. In addition to the state synodic establishments it comprises, the great voluntary religious associations of the Protestant Union, the Gustav-Adolf Society, the Evangelical League, the German Catholic Diet, the Bonifatius Society, the Society for mission-work at home and abroad, the various religious orders and all the numerous associations of different religious Societies, both local and corporate, for the direct or indirect promotion of religious objects.

Societies for the furtherance of Art and Science. Art and scientific research are encouraged by the State academies and assisted by Commissions and Institutes at home and abroad as well as by such private Societies as the Diet of German Jurists, the Law Society, various scientific societies of medical men, naturalists, geographers, historians, philologists, engineers, political economists and social economists. All such societies, whether belonging to localities, to separate states or to the nation at large, are constantly employed in the endeavour to lay before the public the results of their labours and the present state of their knowledge, either by means of the Press or by holding Congresses, thus enabling the necessary grouping and classification of individual effort and efficiency to be effected.

Patriotic-political Leagues. A second group is formed by the Societies of a patriotic or political character, having the interests of both the State and the Community in view. On the one hand there are political party organisations with their central control and the elaboration of the party machine down to the district leagues; on the other hand there are leagues for safeguarding the interest of the father-land and the promotion of national aims.

In this latter class the "warrior societies" (Kriegervereine) and leagues are most prominent. The majority of them belong to the "Kyffhäuser" League which was founded some years ago. Societies with patriotic and political aims are represented by the German Colonial Society, the Pan-German League, the "Ostmarkenverein" and various other societies for preserving German nationality and customs, such as the Society for the preservation of the German language, the Schools' Union and the Navy League.

Social Clubs and Societies. Patriotism and politics are fostered by many other societies as well, societies whose first aim is of a recreative character. These often assume the shape of assemblages of individual classes. In every place, large or small, countless social unions forming centres of recreation and amusement for the various ranks of society are to be found. Some of these are founded for special purposes by certain classes, being sometimes associated with old traditions; such are the social unions of shopkeepers and sea-faring men, the manifold associations of artists and students and the shooting guilds, and sometimes with more modern aims of life in view such as gymnastics and singing, societies, sport, cycling and card-playing clubs, &c.

The gymnastic, shooting and singing societies did much at one time to pave the way to the foundation of the Empire, and carried out on a small scale what the national societies were striving to do throughout the whole country.

Lodges; Charity.

Then again various fraternities and lodges have likewise duties to perform, both of social and public utility. Many of these societies have been founded for charitable and philanthropic purposes, sometimes for the speedy relief of temporary necessity by the organising of charitable festivals and bazaars, at other times working both preventively and directly by the establishments of permanent institutions, such as numerous associations for the care of the sick, hospital unions, the Order of St. John, the Red Cross Society and the Women of the Fatherland Aid society, &c.

Social Care.

A great social duty incumbent upon many of these associations is to supplement the task of making provision for toilers and workers who are in distress. In addition to crèches, kindergartens, and holiday institutions, peoples' kitchens, coffee palaces, public baths, convalescent homes, homes for consumptives of the working classes, and homes for the aged,—these and similar societies have organised employment agencies as well as working mens' colonies, and created residential and other dwellings.

Religious and social considerations have co-operated in bringing about a reform in the public and private mode of relief of the needy, and have paved the way for their classification and grouping into organised associations and unions. These have found their intellectual center in the German Union for the relief of the poor and for general charitable purposes, and also in the so-called Elberfeld system which has rendered possible the necessary co-operation between the centers and individual workers.

Women's Societies.

Since the so-called woman's question has arisen, various associations have been called into being to represent the social interests of women and to protect and minister to the world of women-workers, and these have been formed into various Leagues. Among the most important may be mentioned the League of German Women's Associations, embracing 159 societies, and the League of Societies for Women's Progress.

Representation of the interests of various trades and professions.

The associations representing the interests of trades and professions have adopted new and specially organised methods in accordance with the demands of modern industrial and business life. Here too, we find countless associations and organisations called into existence not only by the State but also to a large extent by private initiative. The further development of these reveals a certain tendency towards a future comprehensive concentration and grouping together. This tendency is entirely at variance with the opinions which prevail at the beginning of the 19th century as to the complete and inevitable resolution of society into units, for at the commencement of the 20th century numerous features for its re-concentration into groups are to be found.

We must first consider the representation of professions as regulated by the state. Germany has at the present time 158 Chambers of Commerce and Trade, and 10 Chambers of Agriculture around which the People's Industrial Council (at present inactive), the German Agricultural Council, and the Colleges of Land Economics are grouped. The interests of traffic are represented by the Home-Railways' Council. Other offices have called in the assistance of expert advisers, such as the Colonial Council, the Board of Emigration, the Stock Exchange Committee, the Social Economic Committee, the Workmens' Statistical Board, &c. The learned professions are regulated by councils of doctors and lawyers.

Besides these there are various independent associations to protect the interests of agriculture, manufactures, trade and commerce,—such as the Farmers' League, the German Commercial Diet, the Central Association of German Manufactures, the Industrial League, the Society for guarding the common economic interests of Rhineland and Westphalia, the Society for commercial Treaties, the Central Society for preparing and examining commercial Treaties, the Society for the maintenance of the Gold-standard, &c. Then there are other Unions to represent the interests of special classes and callings,—the Union of German Smelters, the large Societies of Architects and Engineers, the Unions in the medical profession, the German Fishery Union, the Inland Shipping Union, the German Lawyers' Diet, &c., and Associations which have been established locally throughout the land for all the more important occupations and branches of industry. Their endeavour has been to increase the general knowledge of the community and to spread knowledge among their members on subjects within their province by the carrying out of practical experiments, the publication of literature and periodicals dealing with special branches, &c. This has also been done by the Unions for improving and furthering certain branches of knowledge, such as the Society for improving the breeding of Cattle, Horses and Dogs, the Union of Gardeners and Fruit-growers, &c.

Officials too have formed themselves into Associations for the representation of certain interests. Amongst others the German Officers' Union may be mentioned and the 174 various officials' unions which are leagued together, with a total membership of 128,000, into the German Officials' Societies League. There further exist Unions for Post-Office officials, for railway servants and others. Although all these associations serve the more general objects of their particular profession or calling, there are a number of others whose first aim is to represent their pecuniary interests.

Expert Unions.

Certain industrial branches show a strong inclination to combined representation; for instance, in the mining and smelting industries there are 9 associations representing more than 400 mines; in the iron trade there are 4 such associations with over 2,000 members and works; in the remaining industries there are upwards of 30 larger and smaller unions, principally representing mechanical engineering, shipbuilding, the chemical, textile, leather, paper, brewing, destilling, milling and tobacco trades and industries. The Exchange Association

of German Booksellers with its many thousand members is not limited to Germany, whereas the Central Union of German itinerant Booksellers is exclusively Imperial. The small shopkeepers have combined together into 110 associations with nearly 7,000 members, the hotel and inn-keepers into a league of 200 associations with 17,000 members, the majority of these large Associations being built up by local organisation.

Association in the liberal and learned professions.

Kindred leagues especially representing the industrial side of professional interests also exist in many of the liberal and learned professions, as for example the various German authors' societies, associations of journalists, musical societies, the German Stage Union, the Stage Association, the Artists' League, various arts and crafts societies, societies with funds for the relief of teachers, and societies for female teachers. These societies look after and assure the private circumstances of members of their profession who are unable to work, and also provide for their widows and children. They not only watch over the interests of the various callings, but aim also at rendering material support.

Employers' "Cartels" and Leagues.

A number of the associations which serve the interests of the professions have also made it part of their object to represent their members in the position of employers; at the same time there exist also a number of special employers' organisations for effecting the same purpose. First of all come the employers' leagues proper, cartels, syndicates, &c. (see p. 29) the object of which is to look after and generally regulate the conditions of supply and demand within their branch, then come the so-called Unions of Employers of Labour (Arbeitgeberverbände). The particular purpose of these latter associations is to counterbalance the working men's associations and their endeavours as well as to oppose any efforts on the part of the associated working men to secure an alteration in the existing conditions of work or wages when it does not appear justifiable to the employers. At the head of these stands the German Central League, and next to it the Hamburg League for the Employers of Labour embracing a number of large associations from among the most varied branches of industry, and extending to a number of neighbouring places. The next in importance is the Berlin League of Employers of Labour, &c. In addition to these general leagues there are others for special branches of industry, sometimes of a local character and sometimes extending over large districts of the country. There are 3 for smelting and mining concerns, 11 for the metal industry, 4 for the brewing industry, 4 for the textile industry, 9 local and 1 central for the building trade, 2 in the hat trade, 1 in the manufacture of wall-paper, besides 3 leagues of masters of handicraft in the wood-work industry.

Workmen's associations.

There are four principal groups of workmen's associations—industrial unions, trades-unions, Christian working men's societies and miners' corporations. In 1902 the first group included 60 central leagues with about 733,000 members,

nearly half as many again as in 1897. There were also 11,000 local organisations. The budget of this immense League amounted to 21 million marks with a fixed capital of about 10 1/4 million marks. The expenditure amounted to 10 million marks and was made up of 3 1/2 million marks for the relief of the needy, and 2 million marks for supporting strikes. Up to the present time the part taken by female workers in the industrial union movement has been inconsiderable, although it has much increased of late. In 1902 it included 28,200 females, and has more than doubled since 1898. This number is, nevertheless, only about 3 per cent of the female workers who might enrol themselves in such an organisation (901,000 in all). The largest number of members of the organisation come from among the metal-workers (128,000), masons (82,000), wood-workers (70,000), miners (42,000), and hands employed in the textile industry (38,000). The most perfectly organised of these Unions is the Book Printers' League, consisting of 33,000 members. Among the others, that of the factory hands consists of 33,600 members, those of the carpenters, shoemakers, carriers, tailors, persons employed in the tobacco trade, the building trade, and harbour hands comprising between 14,000 and 24,000 members each.

Trades-Unions.

The second group, the so-called "Hirsch-Dunker" Trades-Unions, comprised 103,000 members in 1902, the majority of them belonging to unions of machine engineers and metal workers. The entire property of the trades-unions, including the invalid and burial funds, amounted to 3 1/4 million marks at the end of 1902. The sums expended in 1902 for the support of members who were out of work amounted to about 250,000 marks, the sums distributed for support during sickness to 62,000 marks. The total outlay in 1902 for sickness and burials, support of the disabled and needy, for providing legal protection and for educational purposes, amounted to 775,000 marks.

Workmen's Christian societies.

In the third group we find industrial and religious forces working together. The Evangelical Societies numbered about 120,000 members in 1902, between 80,000 and 90,000 of whom were leagued together into a Central League. There are 800 Catholic workmen's societies with about 180,000 ordinary members.

The total number of German workmen organised in this manner amounts to about 1 1/4 millions.

Besides these three free groups of organisations there are the Unions of Miners, which are subject to state control.

Journeymen's societies.

In the middle of the nineties there were 140 journeymen's societies in existence, with a membership of half a million. They distributed 32 million marks in aid and support, and their funds amounted to 77 million marks.

Business and Commercial Societies.

Some of the private official and commercial societies combine recreative and educational objects with industrial aims. The most important of the commercial leagues is the German League of Commercial Societies, comprising 86,000 mem-

bers, 25 per cent of whom are principals and 75 per cent employees. The principal aim of this and 3 other great leagues, besides the object of providing recreation, is a practical economic one, its chief object being to provide information as to situations vacant, the assistance of those out of employment, and technical education in their particular branch. In addition there are four large associations of shopkeepers' assistants, where the tendency is almost exclusively industrial.

Private officials societies.

The associations of private officials, with about 15,000 members, are of a similar character to the mercantile or commercial societies. The funds at their disposal for giving assistance in cases of sickness or disablement amounted to 3 million marks. The German Foremens' Association, with a membership of 35,000, is made up of private and state officials.

Tariff associations.

In one branch of trade, at least, the employers and employed are associated to-day in a common organisation, as they used to be in times gone by, for a mutual regulation of the conditions of work. In the German book-printing trade we find an association of principals and apprentices formed for the promotion of mutual agreements as to tariff. Similar associations are gradually making more and more headway in other callings, such as the building, tailoring and upholstering trades.

Guilds.

Attempts have, however, been made to keep up at the same time the old forms of industrial organisation by giving new life to the system of guilds. Amongst the handicrafts there are almost 8,000 guilds including about 1/4 million workmen (a further 50,000 or so artisans are incorporated in the trades-unions).

Organisation according to social legislation.

For information about the organisation of workmen and employers into trade and sick-Funds associations, and councils of advice of various sorts, as connected with social legislation, see special article.

B. Associations.

Associations.

The associations constitute a group of societies of considerable importance. They form to a certain extent an opposition to the unions of manufacturers, being incorporated combinations of consumers. They also serve to unite manufacturers for the purpose of obtaining the necessary means, principally credit, to manufacture. And, finally, this form of organisation embraces certain undertakings, which, in the form of co-operative societies, represent a distinct form of enterprise.

German co-operative societies and associations can look back upon half a century of successful activity. In 1849 Schultze founded in Delitzsch the first co-operative society for buying and selling carpenters' raw material, and in 1850 the co-operative society for advancing loans. About the same

time Raiffeisen founded the Hammersfeld Association for the relief of impecunious agriculturists, and sowed the first seeds of that magnificient institution the Agricultural Savings and Credit Bank Association.

The movement has made great strides, particularly during the last ten years of the past century. In 1890 the number of trade and industrial co-operative societies was 7,608; in 1895, 13,005; in 1900, 19,557. The total number of local associations amounted in 1902 to more than 22,500, which means an increase of about 200 per cent during 12 years. More than 6,000 of these were agricultural associations with a long way over a million peasants as members. By far the larger number of associations in 1902 were combined into 35 Leagues. The most prominent among these are the following:

The three chief Unions.

The General Union of the self-aided Trades and Industrial Associations, which has its head-quarters at Charlottenburg and comprises 29 sub-unions and 1,651 associations; the General Union of Agricultural Associations, at Darmstadt comprising (July 1st, 1902) 25 affiliated unions and 8,363 associations; and the General Agency Union, at Neuwied, embracing 3,982 associations.

In 1902 the associations belonging to the Charlottenburg Union numbered about a million members, their business credit amounted to 179 1/2 million marks and their reserve to 62·9 million. The associations lent their members about 3 milliard marks in credit, raw material, dwellings, the necessaries of life, &c.

The Darmstadt (formerly Offenbach) General Union comprised 7,787 associations in 1902, with a business credit of its associates amounting to 18·4 million marks and a reserve fund amounting to 20 million marks. The Neuwied General Union reported on January 1st 1902 that there were 3,190 associations with a membership of 288,000 belonging to the Union. The assets of the Union amounted to 241·1 million and its liabilities to 240 million marks, so that a clear profit remained of 1·1 million marks. It lent its members 147 million marks in loans and purchase-money. The Central Credit Bank belonging to the Union showed assets amounting to 53·6 million and liabilities amounting to 53·3 million marks. The clear profit of 0·3 million marks was divided in dividends at the rate of 3 1/2 per cent.

Statistics of Associations. Co-operative and Building Societies.

Besides these three gigantic unions, there are smaller ones of some importance, as shown by a review of the collective activity of 22,500 German associations which were classified on March 31st, 1903; 13,481 credit co-operative societies, people's and industrial banks, societies for advancing loans, savings and credit bank associations were carrying on business and advancing personal credit through the agency of a number of central banks. Most of the remainder were chiefly employed in buying and selling, some also in producing goods. The whole were divided into two groups, of 723 industrial and 5,500 agricultural associations.

Amongst the former, 323 were producers, and amongst the latter the majority were occupied in production on their own account, such as dairy produce, wine and fruit growing, &c.

About 1,600 were engaged in the purchase of raw materials, about 250 in the sale of goods, and over 600 were workmen's associations (Werkgenossenschaften). Among the other associations, the most important were the 1,847 co-operative supply associations.*) The constantly increasing importance, however, of the building and dwelling associations (about 500 in number) must not be underrated. Only 625 of all these associations are not subject to the Associations Act. More than two-thirds of those registered have unlimited, and 6,400 limited liability.

Central Co-operative Bank.

The Central Prussian Co-operative Bank was founded to serve as a centre of credit for the various Prussian associations, its original capital being 20 million marks, which has since been increased to 50 million. The total turnover in 1902/03 amounted to over 8,200 million marks, and in the middle of 1902 more than 9,000 associations, mostly agricultural, with nearly 1·3 million members were registered on its books.

XVIII. Schools and Education.

See special treatise.

XIX. Art, Industrial Art and Architecture.

See special treatise.

XX. Theatres and Concerts.

As in the case of many of the subjects discussed above, the development of the German theatre shows characteristic features perfectly at variance with those of other countries.

Permanent companies and theatres.

The most important factor is formed by the large permanent theatres, which are sometimes court theatres, and sometimes municipal theatres which receive considerable subsidies from the purses of German Princes or from the municipal revenue. Sometimes, too, they are undertakings of a purely private nature.

The German Stage Almanac mentions about 700 German theatres, 550 of which are situated in the German Empire. Of this number 100 are municipal theatres and 40 court theatres.

*) These are divided according to the nature of their liability into 220 associations with unlimited liability and 1,527 with limited liability, 5 with unlimited instalment liability, and 95 non-registered associations. Their numbers show a rapid increase. Whilst in 1890 only 984 co-operative supply associations existed, there were 1,400 in 1895 and 1,528 in 1900. The growth during the last 2 years (1901, 1902) has therefore been an unusually large one.

In the majority of these theatres performances are given uninterruptedly during the greater part of the year from Autumn to Spring. The actors have fixed engagements, and performances are given on all, or nearly all the days of the week. Occasionally one company will play consecutively at a number of theatres in the same neighbourhood. Other theatres, again, have touring companies, one for drama and one for opera. About 80 theatres in the German Empire only give performances during the summer or when the bathing resorts are in full swing.

Travelling Companies.

In addition to the permanent companies of the above-mentioned theatres, there exist also about two dozen travelling dramatic companies which tour throughout the Empire and are always well received, particularly in places which have no proper theatre. The number of these touring companies is certainly on the decline in Germany, for there, as opposed to other countries, nearly every place endeavours to support a permanent theatre of its own.

Those dramatic companies, however, which exist for the purpose of reproducing plays in the various dialects—such as Low-German, Bavarian, Viennese, Swabian, Alemanic, &c.—are still of as much importance as ever.

Staff.

In the season 1902/03 the lists of the Union of members of the German stage comprised about 20,000 actors and actresses, vocalists, and chorus singers engaged in German theatres throughout the world. About 15,000 from among this number were actively engaged.

Repertoirs. Authors.

During the year 1902/03 between 650 and 700 novelties were put upon "the boards that typify the world." One-sixth of this number were operas, operettas and other musical pieces. During the same year about 900 German authors, translators, poets, and ballet composers, and 250 musical composers and colaborators had their works performed, or had them accepted for performance. The dramatic authors who have had their works staged during the last few years number 1500–1600, and the number of composers is about 400.

The Art aming the people.

These statements do not however by any means exhaust all that can be said as to the development of the art. Besides the performances given by amateur societies in most towns and villages, evidence is often found of an endeavour to draw wide circles into co-operating in serious dramatic efforts. To this class of society belong first and foremost the student clubs for the resuscitation of classic art, and next in importance come the historical, patriotic and religious plays which are performed in so many places. The most important of this latter are, for instance, the Passion Play at Oberammergau and the festival performances at Rothenburg and other places. The festival play house at Bayreuth holds quite a unique position.

Free stages and popular art.

The serious side of the Art also is marked by the efforts which are being made by numerous societies to bring before the public by means of free stages and

aspiring talent plays which are unsuitable for ordinary theatrical reproduction. Efforts are also being made to familiarise the broad masses of workmen and artisans, and also school children, with literary masterpieces, and thus popularise the art among the people.

Musical life. There is at present no trustworthy information concerning the richly developed musical life of Germany; a country where music is studied and enjoyed more than anywhere else by means of Royal, municipal, military and private orchestras as well as by the above-mentioned societies. Here also, as in all matters connected with the artistic and intellectual activity of the country, figures and statistics can assist but little in giving that appreciation which can only be obtained by personal acquaintance and intimacy with the inner life of the nation.

XXI. Army and Navy.

The standing army. According to the Act dated March 25th, 1899, Bavaria has to maintain 3 army corps, Saxony 2 and Wurtemberg 1, while Prussia and the remaining Federal States have to maintain 17, making thus a total of 23 army corps altogether. Each army corps is divided into two or three divisions, each of which is, as a rule, again split up into two infantry, one cavalry, and one field-artillery brigade; these latter are composed of 2 regiments, or, in single instances, of three. The remaining arms, as well as the communication troops, are placed immediately under the direction of the corps commanders. The Guards army corps is distinguished from the rest by the important difference that its cavalry is collected into a special Guards cavalry division. The total number of divisions is 49.

The peace footing of the German army for 1903 was as follows:

	Officers	Non commissioned officers	Men	Further personnel	Service Horses
Total Infantry Comprising:	13,384	48,859	337,067	2,570	810
a) Infantry—216 regiments and 607 battalions	12,073	44,070	323,569	2,475	—
b) Rifles—18 battalions	388	1,434	9,781	72	—
c) Machine-guns,—15 divisions	60	203	952	1	810
d) Militia—295 districts	863	3,152	2,765	22	—
Cavalry—93 regiments, making 482 squadrons*)	2,436	9,670	57,255	816	65,921

*) Comprising 10 regiments of Cuirassiers, 28 of Dragoons, 20 of Hussars, 25 of Lancers, 4 of Heavy Cavalry, 6 Light Horse and 17 squadrons of mounted rifles.

	Officers	Non commissioned officers	Men	Further personnel	Service Horses
Field-artillery—94 regiments and 583 batteries	3,062	11,909	53,301	996	33,624
Foot-artillery—18 regiments and 163 companies	946	3,893	20,403	140	556
Engineers—26 battalions, 102 companies	598	2,404	13,033	104	—
Communication troops comprising:	584	2,764	11,965	125	4,715
a) Railway troops	185	723	3,778	33	—
b) Telegraph troops	50	173	1,353	13	—
c) Balloon troops	17	54	343	5	58
d) Commissariat, 23 battalions	332	1,814	6,491	74	4,657
Special formations	572	1,393	2,474	68	—
Non-specified military	2,764*)	187	2	223	—
Total peace footing of	24,346*)	81,079	495,500	5,042**)	105,626
Number belonging to					
Prussia	18,939	62,753	384,729	3,891	82,548
Saxony	1,738	5,997	35,899	368	7,751
Wurtemberg	935	3,260	19,725	201	4,250
Bavaria	2,734	9,069	55,147	582	11,077

The total strength of the German standing army amounts accordingly to 605,967 men. The war footing numbers 2,549,918 men exclusive of the Landsturm (last reserve) and supplementary reserves (about 3 million men). The strength of the German field army is placed at 1,335,000 men, 425,000 horses, and 4,200 guns.

The following table shows the position of the German navy in completed modern vessels.

Number and type of ships	Displacement in tons	Indicated h.p.
14 Battle ships (over 10,000 tons, launched 1891 and later)	153,568	171,000
8 Coast iron-clads (over 4,000 tons, launched 1889 and later)	32,912	42,000
3 Armoured cruisers (over 8,000 tons, launched 1899 and later)	28,669	46,200
Latus ...	215,149	259,200

*) In addition to 8 officers at the Imperial military court.

**) Including 2,203 army doctors, 1,056 paymasters, 679 veterinary surgeons, 1,011 gunsmiths, and 93 saddlers.

Number and type of ships	Displacement in tons	Indicated h.p.
Transport . . .	215,149	259,200
6 Large protected cruisers (over 5,000 tons, launched 1892 and later)	34,806	62,000
13 Small protected cruisers (over 2,000 tons, launched 1887 and later 10 since 1898) . . .	39,084	103,000
7 Small unprotected cruisers (over 1,500 tons, launched in 1890 and after)	11,684	22,800
6 Gun-boats (over 800 tons, launched 1898 and later)	5,550	7,800
	306,273	454,800

Ships in course of construction:*)

Number and type of ships	Tonnage	h.p.	Total	
			tons	h.p.
6 Battle ships each	13,200	16,000	79,200	96,000
3 Armoured cruisers**) . . „	9,500	19,000	28,000	55,000
5 small protected cruisers . „	3,250	10,000	16,250	50,000
			123,450	201,000

The remaining vessels comprise 5 obsolete battle-ships, 12 obsolete armoured gun-boats, 3 obsolete armoured cruisers, 9 small cruisers, 1 obsolete gun-boat, 15 training ships, 8 special service ships (amongst them 2 yachts, "Hohenzollern" and "Kaiseradler"), 3 harbour boats, 41 large torpedo-boats (over 230 tons) and 79 smaller torpedo-boats (up to 155 tons). Amongst the larger torpedo-boats are 30 homogeneous ones of modern construction (launched since 1899) each of 350 tons displacement, 6,000 h.p. with a speed of 26·5–30 nautical miles an hour. 12 additional boats of this type are in course of construction.

The following ships are destined to serve as auxiliary cruisers in time of war: 9 high speed steam-ships with a speed of 18–23·5 nautical miles and a total registered tonnage of 103,070 tons, and 20 mail steamers with a speed of 15–17 nautical miles and a total tonnage of 185,400 register tons.

The naval forces (according to the Budget of 1903) are made up of 1,169 naval officers, 207 engineers, 186 medical officers, 149 paymasters,

*) Without including those in the Estimates for the present Budget.
**) Including an armoured cruiser of 9,000 tons and 17,000 h.p.

20 chaplains, 583 naval cadets, 114 special service officers (rockets, torpedos, &c.) and 29,764 warrant officers, petty officers and men, in all 32,192 persons. In addition to these must be mentioned the marines and artillery, 1,275 and 2,387 strong respectively, which are attached to the navy, so that the standing strength of the naval forces amounts to 35,854 men.

The supplementary forces on leave and in reserve number about 630 officers, 53 engineers, 373 medical officers, and 78,000 men.

XXII. Administration of Revenues in the Empire, the State and the Municipality.

The Empire, the Federal State and the Municipality form the three principal factors which are at the present moment, each within its own precisely defined sphere, responsible for the direction and execution of the requirements of the community at large. For this reason, as well as owing to their having assumed various duties of a semi-public nature which were originally private economic duties and later transferred to them by law, they exert a deep influence upon the entire development of economic life of Germany.

Principles of the Imperial Budget.

Among the duties which fall to the share of the Empire in accordance with the Constitution and the provisions of Imperial legislation, those to be considered with regard to the administration of the revenues of the Empire are the maintenance of relations with foreign countries, the administration of the colonies, the Army and Navy, the maintenance of the Supreme Court, "Sozial-Politik" (Social Economics), the administration of the Post, Telegraphs, Telephones*) and the Imperial Railways. The Empire covers the costs connected with these duties in three ways: 1. Indirectly by raising duties and taxes on the sale and consumption of certain commodities**); 2. directly by raising duties and fees, and from the proceeds of its various fiscal enterprises; 3. by making the various Federal States responsible for any deficits arising—unless caused by loans—whilst these States divide among themselves any surplus remaining from certain sources of revenue.

Administration of revenue in the States themselves.

All such matters of internal administration, the administration and execution of Justice, the Police, Church and Educational matters, the advancement of science and art and general economic duties connected with agriculture, trade and commerce, including the improvement of the land,

*) Bavaria and Wurtemberg have their own Post and Telegraphs Administration.

**) Taxation of beer and brandy in Bavaria and Wurtemberg is carried out by these states on their own account, whilst salt, tobacco and sugar are to-day taxed uniformly throughout the Empire.

construction and maintenance of inland navigation canals and harbour quays,—these are all attended to by the states themselves. In addition to these the administration of extensive state works and concerns, such as railways, state canals, mines, forests, estates horse-breeding establishments, &c., must be mentioned in connection with the larger Federal States. The chief sources of revenue of the Federal States are direct state taxes, fees and duties, lottery proceeds and the profits from the various state undertakings.

Administration of municipal revenues.

Finally, the duties of the municipal bodies—which can be subdivided into various classes, and are accordingly governed and limited by the state with regard to their financial arrangements—are in many respects similar to and closely connected with the duties of the Federal State. They consist in taking care of local interests, attention to public health, care of the poor, schools, making and repairing roads, &c. Waterworks, slaughter-houses, tramways and gas and electric supply works are becoming on an ever increasing scale the property of the municipality, as well as public baths, breweries and brickfields, theaters and concert establishments. They further contribute towards covering the expenses of certain works undertaken by the state, which are directly connected with their locality, and in return receive assistance from the state in executing various tasks. The revenues of the municipalities, apart from the profits of municipal works, consist principally of direct taxes which are raised as a rule in the form of additions to the direct state taxes. In spite of this, however, the sums paid for the use of some of the municipality's property still plays a very important part in certain places. To this must be added the considerable sums often paid for the use of open spaces by such undertakings as transport concerns, electricity, gas and water works which do not belong to the municipality.

Circuits, Government districts and Provinces.

Supplementary intermediate positions between municipality and state are held by the local districts, government districts and provinces. They generally have precedence of the municipalities, and have to carry out the public economic and educational problems. Their requirements for this purpose are met by the state and the municipality, but they also raise direct taxes and dues.

There are no comprehensive figures for this last group, nor for the revenues of the municipalities. It is however easy to see how public duties, affect the Budget throughout the Empire and the Federal States.

Budget of the Empire and Federal States.

The following summary embraces separate figures (in million marks) for the Imperial Budget, the Total Budget of the Federal States and the Prussian Budget, the latter being the largest of the Federal States. The figures are taken from the estimates for the financial year of 1902, and are expressed in million marks:

	German Empire	Federal States	Separate figures for Prussia
Gross Expenditure			
Total	2,441	4,375	2,622
Ordinary	2,290	4,209	2,622
Regular	2,109	4,042	2,476
Occasional	181	167	147
Extraordinary*)	151	165	—
Gross Receipts			
Total	2,441	4,356	2,622
Ordinary	2,290	4,210	2,622
Extraordinary*)	151	146	—

According to the estimates, therefore, the expenditure and receipts of the Empire balance each other, whereas the Federal States show a deficit of 19 million marks in their revenue.

The total sum required by the State is divided according to the purposes for which it is employed as follows:

Purposes for which required	German Empire	Federal States	Separate figures for Prussia
I. Expenditure upon objects of revenue made up of:	511	1,959	1,273
State Railways	83	1,283	975
Post and Telegraphs	471	53	—
Mines	—	214	161
Forests	—	89	43
Estates	—	24	8
Miscellaneous undertakings	6	166	85
II. Other demands upon the Government made up of:	1,833	1,355	723
External**)	57	56	27
Internal***)	72	400	167
Education and public worship†)	2	303	165
Justice	3	199	121
Finance Board	693	359	243

*) Only such occasional outlays are reckonned under extraordinary expenditure, which are met and covered by extraordinary sources of revenue, such as receipts from the reserve funds or loans.

**) Inclusive of the Head of the State, Court and Government.

***) Inclusive of Police, Industry, Commerce, Traffic, Agriculture and Public Buildings.

†) Science, Education, Art, and Ecclesiastical matters.

Purposes for which required	German Empire	Federal States	Separate figures for Prussia
Proportion laid upon the Federal States*)	565	—	—
Pensions	122	34	—
Miscellaneous	0·4	4	0·2
Army	678	—	—
Navy	205	—	—
III. National Debt (administration, interest and amortization)	94	466	278
IV. Payments to the Empire (proportionate payments, balances paid and other payments*)	—	587	348

The gross receipts are divided as follows:

	German Empire	Federal States	Separate figures for Prussia
A. Ordinary Revenues	2,290	4,209	2,622
I. Revenues from State Concerns, gross	564	2,621	1,810
„ „ „ „ (net..	53	662	537)
made up of:			
State Railways	90	1,898	1,416
Post and Telegraphs	448	59	—
Mines	—	243	190
Forests	—	177	81
Estates	—	52	24
Other concerns	26	192	98
II. Taxes	1,054	599	255
made up of:			
Direct taxes**)	—	435	211
Sumptuary taxes***)	995	83	0·03
Traffic duties†)	95	56	33
Legacy duties and duties on donations	—	26	10

*) See p. 97. The payments are first of all actually made on both sides and appear twice over in the budgets, those amounts figuring as expenditure in the balance sheets of the Federal States, appearing in the receipts of the Empire, and vice versa. Only the difference in amount, however, need be taken into consideration in estimating the respective financial positions.

**) General income tax, property tax, private income tax (Landed property, house property, house rent, industries, capital, and special taxes), licences taken out by itinerant vendors, railway and mining royalties, and other personal taxes (poll taxes).

***) Taxes on beer, meat, and other articles in use, dog licences and duties on luxuries.

†) Duties on transferance of land property, stamp fees.

	German Empire	Federal States	Separate figures for Prussia
III. Taxes	11	181	92
made up of:			
Traffic fees	2	28	8
Other fees of Administrative Offices, Fines	8	24	8
Legal fees, Fines	1	129	76
IV. Re-inbursement from Imperial Treasury for administration of customs and Imperial taxes	—	65	42
V. Other sources of revenue*)	661**)	152	86
VI. Surpluses and balances from previous years	—	37	—
VII. Remittances from Imperial Treasury	—	554***)	337
B. Extraordinary Revenues	151	146	—
I. Receipts from reserve fund	—	8	—
II. Loans and balances of Loans in previous years	146	98	—
III. Other funds at the disposal of the State	5	40	—

Total gross Budget of the Empire and Federal States.

In order to ascertain the total Budget of the Empire and Federal States, it is necessary to subtract a number of mutual payments both between the several states and between the latter and the Empire. The payments made between the Federal States amount both in revenue and expenditure to 39 million marks, which comparatively small sum is not subtracted in the foregoing summary. The payments made by the Empire to the Federal States, however, amount to 692 million marks in all; against this must be put payments 596 million marks, made by the Federal States to the Empire. If all the amounts which counterbalance one another in the entire Budget for Empire and Federal States are omitted, the following result is obtained:—total expenditure 5,547 million marks; total revenue 5,536 million marks.

*) The receipts under this heading consist mostly of revenues from state capital (interests, &c.), private and official contributions to state expenditure, rents, proceeds from the sale of landed and portable state property, and occasional, miscellaneous revenues.

**) This includes 581 million marks in proportionate payments (see note * p. 100), 48 million marks from the Imperial old age pensions funds, and 11 million marks from the Chinese indemnity.

***) See note * p. 100.

Imperial and State Debts.

The indebtedness of the various States is of great importance in judging the position of the state finances. In 1902 the consolidated debts of the Empire and the Federal States reached a total of 13,980 million marks, or 248 marks per head of the population of the Empire. Almost one-half of the total amount (6·72 milliard marks) fell to the share of Prussia, more than a fifth (2·73 milliard marks) to that of the Empire, and more than a tenth (1·46 milliard marks) to Bavaria. The administration and payment of interest on these debts claimed 3 million and 476 million marks respectively, making in all 8·51 marks per head of population. In addition 72 million marks (or 1·27 marks per head of population) were employed for amortization.

Employment and security of debts.

These debts are, however, principally incurred for direct profit-bringing purposes. Out of the 11,246 million marks debts of the separate states, no less than 7,404 million marks were expended in acquiring railways for the State, or in the construction of new lines. Further, out of the 2,734 million marks Imperial Debt, incurred for the most part for the defence of the country, as much as 146 million marks was for loans for railways. The total invested capital of the 48,344 kms of German State Railways amounted at the beginning of 1902 to 12,330 million marks; 7·81 milliard marks fell to the share of Prussia, 1·39 milliard to Bavaria, 0·87 milliard to the Kingdom of Saxony, 0·62 milliard to the Empire, 0·60 milliard to Wurtemberg and 0·56 milliard to Baden. The remaining 0·48 milliard marks were divided among the other Federal States.

Among the remaining items which constitute the property of the state the extensive possessions of forests and estates must be mentioned; they include 5·54 million hectares or fully a tenth part of the territory of the German Empire. The revenue derived from this source in 1902 amounted to 116 million marks, which, at a rate of 3 1/2 per cent (corresponding to the present value of Consols), equals a capital of about 3 1/3 milliard marks. Since there is still other revenue producing state property of value, it can will be said that there are almost no State Debts which are not covered.

Budget of Berlin.

Although the city of Berlin, in consequence of its size and position as capital of the Empire, is not by any means a typical example, we may complete our summary by giving the principal items in the budget of this city. According to the estimates for 1903, the 104 million marks ordinary and 13·5 million marks extraordinary expenditure brought the total requirements of the city (inclusive of 72·5 million marks for the cost of working municipal concerns) up to 190 million marks. The general administration claimed 14·3 million marks; the local contribution to the state police-administration 5·2 million marks; public health 16·9 million marks (12 million for regular and about 5 million marks for occasional expenses); education and furtherance of arts 25·2 million marks (21·9 million for regular and 3·3 million marks for occasional expenses); the furtherance of economic interests 21·5 million marks (18 million for occa-

sional and 3·5 million marks for regular expenses) which last item includes: construction of roads, &c. 17·9 million marks,— fire and extinguishing apparatus, &c. 2·2 million marks. 13·2 million marks were devoted to the care of the poor, and 19·5 million marks to amortization of debts; other miscellaneous expenses amounted to 1·5 million marks.

On the other hand there was a revenue amounting to 29·8 million marks from private economic sources. This included 22·5 million marks profits derived from municipal works divided as follows:—gas-works, 6·9 million marks; water-works, 5·8 million marks; drainage and irrigation works, 3·1 million marks; cattle-markets, slaughter-houses, and meat-inspection establishments, 1·8 million marks; and market-halls, 1·6 million marks. In addition to this, 8·4 million marks are obtained by fees, 64·4 million marks in taxes (comprising 31 million marks in municipal taxes, 21 million marks in ground rents, and 8 million marks industrial taxes), 3·9 million marks from state and private contributions, 5·8 million marks from loans for public buildings, and 5·1 million marks assignments and transfers included as revenue in the Budget. If the 72·5 million marks working expenses for municipal works, which were eliminated from the first item, are included, this makes a total revenue of 190 million marks.

Public expenditure per head of population.

In conclusion, details may be given briefly showing what the claim made upon the individual by the public expenditure amounts to per head of the population. The following are the figures for the population of Berlin in 1903: The total sum annually demanded per head for the actual requirements of the state (not including the cost of working of Imperial state and municipal concerns covered by their own profits, which alone makes 96·55 marks per head) was 95·43 marks; the Empire claimed 21·93 marks, Prussia 21·15 and Berlin 52·35. These amounts are divided as follows:

Expenditure per head of population in 1903.

	Germany	Prussia	Berlin	Total
	marks			
1. Army and Navy	17·00	—	—	17·00
2. Foreign affairs	0·78	0·01	—	0·79
3. Education, Science, Art, and Ecclesiastical matters	0·03	4·50	13·04	17·57
4. Agriculture, Industry, Commerce, Traffic, and general economic expenditure	1·34	5·39	11·33	18·06
5. Law and Police	0·03	5·17	2·73	7·93
6. Social economics and care of the poor	0·81	0·59	6·98	8·38
7. Public hygiene	0·03	0·14	8·91	9·08
Expenditure for certain public needs (total of 1–7)	20·02	15·80	42·99	78·81

	Germany	Prussia	Berlin	Total
	marks			
Forward (total of 1–7) . . .	20·02	15·80	42·99	78·81
8. General State and Administration expenses	0·20	4·70	7·02	11·92
9. Debt expenses (not including the Prussian railway debt, nor the profit earning debt in Berlin)	1·71	0·65	2·34	4·70
Actual requirements of the State (total of 1–9)	21·93	21·15	52·35	95·43
10. Additional working expenses (including the cost of Prussian Railway debt and municipal profit earning debt)	8·13	42·48	45·94	96·55
Total requirements of the State (total of 1–10)	30·06	63·63	89·29	191·98

XXIII. The German Colonies.

The following tables comprise the most important statistics concerning the German colonies:

Subject	East Africa	Cameroons	Togo	South-West Africa	New Guinea	Caroline, Palau and Marian Island	Marshall Islands	Samoa	Kiauchau
Area (1,000 sq.-kms) . . .	995	495	87·2	835	239	2·08	0·415	2·57	0·552
Population per thousand	6,847	3,500	2,500	200	380	50	15	33	102
white settlers (total number)	1,247	581	159	4,674	301	145	69	347	3,442
German settlers	965	494	149	2,595	207	39	36	151	?
Troops quartered in the colony. . German	232	101	7	826	4	3	—	2	2,754
(Estim., of 1903) Colored	1,699	900	150	?	210	?	—	40	128
Railways (kms)	87	—	—	382	—	—	—	—	302
Revenue and Expenses 1903 in thousand marks									
Receipts	8,462	3,666	1,096	8,431	990	429	—	541	12,808
„ from colony itself	3,096	2,083	1,096	2,171	108	51	—	291	455
„ „ the Empire .	5,365	1,583	—	6,260	882	378	—	250	12,353
Expenses, occasional . . .	1,067	399	117	1,655	109	143	—	184	7,470
„ regular	7,379	3,256	967	6,762	876	284	—	348	5,277
Foreign Trade 1902 in thousand marks									1902
Imports (total)	8,858	13,276	6,206	8,568	2,211	988		2,398	1903 25,645
„ from Germany . .	2,065	7,659		7,229	1,010	392		584	?
Exports	5,383	6,264	4,194	2,213	1,121	964		1,692	8,909
„ from Germany . .	1,521	8,006		353	300	372		?	?

Ernst von Halle.

THE GERMAN STATE BUILDING

The plan of the site of the German State Building will be found on the back of the title page of the Exhibitors' list.


B.Schmitz fec.

THE GERMAN STATE BUILDING.

By command of His Majesty the Emperor, the German State Building has been erected so as to resemble the principal part of the Royal Palace at Charlottenburg. It stands like a historical monument among the edifices erected by the United States in the gigantic amphitheater of the Exposition, in a free and open space interspersed by flowing cascades. As an exhibition building, it presents to the New World an embodiment of the renowned European civilisation of past centuries, while as the representative edifice of the German Empire, it is symbolic of the new lustre of the old Prussian Monarchy.

The Prussian crown has shone from the dome of the Charlottenburg Palace ever since it was erected; the Great Elector's son began the Palace while he was the Elector Frederic III. and finished it as King Frederic I.

He availed himself of the princely art of those days, which was dominated by the Court of Louis XIV. at Versailles. But in Brandenburg-Prussia this art assumed a characteristic form. The Charlottenburg Palace shows traces of international origin, while the Royal Palace in Berlin, the principal part of whose more antique decoration is reproduced in the "German State Building," owes its authoritative historical impress to a great German artist. In Germany architectural styles do not, as in France, bear princely titles to mark their dates. The voice of general culture classifies them. When they are named after persons, artists' names are chosen, and the right to this royal honour in German art was won by Andreas Schlüter, in the service of the first Prussian King. Thus the artistic type of the "German State Building" is of national value.

The task of its architect, Professor Bruno Schmitz, consisted in moulding this historical art-monument into a living work. From the Charlottenburg Palace he copied the whole appearance, the front and middle halls and well-staircases with the two principal saloons,—from the Palace in Berlin, one of ist most beautiful rooms for which Schlüter alone is responsible. In both these princely dwellings many works of art and collections of furniture have been

brought together. In the adjoining building containing the German wine restaurant, features of Schlüter's last and finest private work in Berlin are artistically made use of. This eclecticism was justified, for it represents the essence of German art during the transition period from the 17th to the 18th century. France and England have followed suit in the choice of their representative buildings, they having also availed themselves of historical artistic forms derived from former periods. They, however, could adopt patterns which are characterised by the uniformity of their ancient and for the most part national traditions. Such conditions are not known to the culture of art in Germany, and in the March country less than anywhere else. Slowly and painfully was the harvest gathered in. Vigorous growth was followed by stagnation and relapse, for the Thirty-years War came like a whirlwind and destroyed its finest germs. The next rise of art in Brandenburg-Prussia begins with that period in which the middle parts of the Charlottenburg Palace arose. It was a new beginning, partly supported by foreign aid; but the organising power which then manifested itself in such a measure in the domain of art had originated a generation before, and had been tested throughout all Europe with political and economical success. Its exponent was the Great Elector. With a strong hand Frederic William united the scattered possessions of the Brandenburg-Prussian State into a great national power. Time and means were lacking for much art culture, and buildings served rather for fortifications than for show. During the last ten years of his reign, however, a change began. His victorious arms were mirrored in art. This can be seen in a series of wall tapestries which decorate a hall in the upper story of the "German State Building." They were first executed in Berlin for King Frederic I., and were made on carpet looms of French origin from designs by Dutch artists, but the order for them was given as far back as 1686 by the Great Elector, and they commemorate his victories over the Swedes.

A similar connection between matter and form predominated in the art of Berlin on the eve of the monarchy. Its hero always remained the Great Elector, the princely designer was the future King, while the artists were mostly foreigners.

Similar conditions prevailed at the commencement of the Charlottenburg Palace, only there the powerful personality of the Great Elector somewhat yields to that of a charming princess. For this palace was a personal present of the Prince later known as King Frederic I. to his consort. It bears the name of the first woman who sat upon the Hohenzollern throne, who—as Frederic the Great says—"introduced social grace, true delicacy combined with love of art and science into Prussia", the friend of the philosopher Leibnitz, Sophie Charlotte.

In 1695, eleven years after their mariage, the Elector bought an estate for her, called Lützе, situated near the Spree "a short mile" west of Berlin. The first plan for the little country villa, built only to serve as a temporary residence, was probably that by Johann Arnold Nering, who at that time directed the building of the most important edifices in Berlin. He died,

however, in 1695, and yet as long after its inauguration as 1699 we find the mother of the Electress describing the part already inhabited by her as "only half finished." The oldest center part moreover—the "corps de logis"—which was supplemented at Charlottenburg by plain low additional buildings for the court officials, the "Officen" for the "Cour d'honneur," is shown at St. Louis otherwise than it appears at present. The main front at that time faced the garden. In an illustration contained in a description of the Palace written in 1702 but only published in 1706, the front only shows a flat dome springing from the oval projecting garden saloon. The architectural style of this garden front was however the same as it is now, and this prevails also in the present principal front turned towards the "Cour d'honneur." It follows the traditional school of the old Renaissance. Schlüter probably had a share in the formation of this old front, for in 1694 he entered the service of the Elector of Brandenburg as sculptor. His first labours were exclusively confined to sculpture, but after his return from a journey undertaken to Italy for the sake of study, he applied himself to building in Berlin. In the Zeughaus his art gave way to French classicism, but on the Royal Palace he has stamped the impress of his powerful individuality. The front of the Charlottenburg Palace, as seen to-day, and after which the „German State Building" is erected, was designed by Schlüter's colleague and successor, the master whom Sophie Charlotte herself called her "Oracle on building,"—Eosander nicknamed "Goethe." Born in Sweden, the latter obtained his artistic training in Italy and France. His mistress had also received the first impressions which formed her taste from the same source. At twelve years of age the intelligent princess, who was married to the Elector of Brandenburg before the completion of her 16th year, visited in the company of her mother the Court of Louis XIV. at Versailles. From that time the French language became to her the acme of all polite manners, and French art synonymous with art itself, only in music she preferred the Italian School. An epigram written at her estate in Lietzenburg says:

"qui regna d'Italia il dolce riposo
qui brilla di Francia la cara libertà."

From this twofold source then, that art was derived by which Eosander transformed the Palace of the Electress in 1701 into a residence worthy of the Queen. It was effected in a practical as well as striking manner by the round central chamber and its projecting gable which unites the whole building, and by the towering dome which majestically crowns the whole. The latter afforded at the same time an increase of space for its "Tambour." It is closed by windows, and forms a round chamber suitable for a vestibule. But the exterior of this cupola tower at Charlottenburg appears too heavy in proportion to the building underneath. This fault has been fortunately avoided in the "German State Building" at St. Louis by turning the windows into arcades from which Bochumer bells chime forth and the electric search-light disperses its rays. Nor is the effect of the newly added pictorial decoration on the whole frontage of the German house less favorable. Both the large

sculptured groups of figures on either side of the gable and the big shield over the centre "tambour" arcade, where the Charlottenburg castle shows only a plain clock, give the middle projection a far better base for the cupola. This was the more necessary because the building at St. Louis does not lie low as in Charlottenburg, but on a stately height. It has unmistakably gained by the exchange of the "Cour d'honneur" for a perron leading up to it, for the Charlottenburg palace was gradually and not without constraint adapted to the almost incomparable grand breadth of the French palaces. The German State Building in its compacter form, more according to German taste, is fully justified, especially by its high cupola, in towering over the exhibition city as a far seen and attractive object. But the significance of the national and historical style of the Charlottenburg Palace lies in its interior; it is there that it attains to that magnificence, designated in the language of art as "Royal." Five of the principal rooms have been reproduced in the "German State Building" viz., the two centre circular saloons, with the well-staircase, the "Oaken Gallery," and the "Tressenzimmer" (galloon room). The prevailing taste in these is the Italian, developed in Versailles, but within the widest limits. Single forms are defined in character by the active artificers of that period in Berlin, who, mostly schooled abroad, manipulated the wealth of forms of the French ornamental style according to their own independent fancy.

The artistic value of these rooms lies in their harmonious keeping; they gain a personal character through their grand plastic and through the paintings on their ceilings. The staircase is most imposing, the gently ascending steps leading in a three-fold spiral from the spacious area of the vestibule, the whole being lighted by a subdued reflection from the white walls. The white stucco, only gilded here and there in well chosen parts, imparts an elegance and yet a solemnity to the place which gives it a distinct character without making it appear ceremonious or stiff. One feels that this staircase belongs to the dwelling of a Princess; the majesty of victories won by force of arms, at that period so often impressed by such places, yields here to the scepter of Apollo among the Muses. They are indeed present, painted on the ceiling in traditional forms leading us back to the pleasing art characteristic of Correggio and the Venetians. Likewise on the stucco, bas-reliefs of Hermes accompanied by troops of Cherubs wreathed with festoons of flowers, represent the four Seasons. Above the window-niches and on the wall reaching to the Cupola, these are joined by groups of music-making "fauns amourettes," and the walls beneath the arched stair-vault are decorated with emblems depicting the arts of peace.

The whole decoration with its delicate bas-reliefs and lines depicting the figures in life-like and free and airy, but never obstrusive porportions, dates from the French school of the period.

In the "Oaken Gallery," traditions of German home art prevail to a greater degree. This room served as a dancing hall, but by reason of its great length resembles a gallery. As its name implies, this type of room took its

rise from the Italian Renaissance-Palaces. But there it served solely for monuments, whereas in the French Palaces for royal state. On German soil even these long outstretched saloons convey some idea of comfort on account of the parquetted wainscotting.

Here the panelling of the walls is in oak, and the combination of brown with the gold of the carvings, according to German taste. Pilasters and panels give the walls a quiet tone, while the richer play of form is confined to the upper terminations. Here North German feeling found expression in natural, moving, living forms, particularly in the crowns and finish of the picture frames. But also in the portraits of Frederic I. and Sophie Charlotte which decorate the gallery, and in the frames of the wall-niches which enclose mythological scenes above the mirrors, the precision of French decorative art, as seen prevailing in the lower parts of the walls, in the principal cornices and doors, is interrupted by a fresh feature. It is remarkable that all these parts show the Prussian Eagle, and everywhere in a natural position,—with outspread wings! At Charlottenburg the flat vaulted ceiling is only white; at St. Louis it will be ornamented with paintings corresponding to other ceilings in the palace, especially with those of the Dutchman Peter de Coxi. Through rich colouring and its being greatly widened, this saloon will be the most elegant in the "German State Building."

The "Tressensaal" (galloon room) at Charlottenburg belongs to the magnificient suite which opens on the garden side, and combines the best methods of decoration for a princely and yet homely dwelling room of that period. In spite of the pilaster divisions the flat surface prevails. This is due in addition to the mirror panelling, to the hangings of purple silk on which gold bands or tresses are sewn in bold outlines. This style, which has been revived lately particularly in Austria, was then customary for ornamenting beds of State, and the pattern itself reminds one, as also the grotesque figures in the door and mirror wainscotting, of the sketches of Berain and Mardt; but their employment as wall decoration, and the graceful outlines of the folds betray North German art. The carvings resemble those of the "Oaken Gallery." Here also the Prussian Eagle appears everywhere, beside the horse in the Hanoverian arms and the sign manual of Sophie Charlotte. The numerous candelabra restored in bronze and gilt, have a beautiful effect on the purple back-ground. These and the furniture consist mostly of pieces lent by Royalty, manufactured in Germany about that time. And thus these halls in the Charlottenburg Palace, like the German poetry of that period, transmit unaided in their natural language strange lessons of harmony and rhythm.

Through Schlüter's genius, meanwhile, powerful works full of imperishable beauty were produced; the equestrian statue of the Great Elector near the Palace bridge, and the series of masked dying warriors on the Zeughaus bear witness to this. Nor is Schlüter's art quite absent in the Charlottenburg Palace. His spirit is apparent in the four large "bas-reliefs," which are

let into the walls of the round saloons. They were designed in the antique, but carried out in the fullness of form of Rubens. They show in classical and allegorical style the influence of Brandenburg's Electors—probably Frederic I. and Frederic III.—on the civilisation of their country. Their style resembles in the freshness of its picturesque composition and in the firmness of the individual figures the reliefs on the pedestal of the Elector's monument. And outside, at the entrance to the palace courtyard where the pair of gladiators copied from the Borghesian model advance their shields as if to protect the peace of the house, the sentry-boxes which serve as their pedestals betray by their massive compactness the hand of Schlüter, as also the decorated frieze of the Berlin Zeughaus with the vigorously portrayed figures of dying warriors, reduced in size, but losing none of their inward grandeur. But these are only isolated examples of Schlüter's wonderful art. They pale before the splendour with which he surrounded the young Prussian Crown in its home, the Hohenzollern Palace in Berlin. Out of a composite edifice consisting of various disjointed buildings standing side by side, of the old Margraves and Electors, he erected a royal palace which even in its present, (according to Schlüter's plan) unfinished form, is, as a residential seat of the German Emperor, unsurpassable in majesty and architectural style. After this work, Schlüter was advanced from "Court sculptor" to "Director of the royal Palace." Thus he is named in the new patent of the 2nd Nov. 1699, and from that date to the Summer of 1706 he spent his whole energy on the building of this palace. In the first two years his efforts were strained to their utmost, for Schlüter's work had to keep pace with political events, and the king had expressed his wish to enter his new Palace in Berlin on the 6th of May, 1701, after the coronation in Königsberg on the 18th of January, and to enter at the triumphal gateway riding past the equestrian statue of his father, which represents the latter as a Roman Conqueror. The inner apartments were also to be royally decorated for his reception, above all the great state chambers in the second story. And they were ready in their main points; they have remained, except for a few supplementary alterations, almost unchanged ever since, as the chief place in which the might and glory of the German Empire are reflected in its solemn as well as its festive ceremonials.

This was a more excellent performance for rapidity of execution than the whole princely art of Europe at that time could have shown, and it was accomplished mostly by native labour in the small city of Berlin, which had till then supplied her artistic requirements from foreign sources.

It was a happy thought to memorialise this great achievement in the history of art, in the "German State Building." One of the last, and doubtless most beautiful pieces of decorative art in the "State Chambers" of the Berlin Royal Palace, has been faithfully reproduced at St. Louis. It is the ceiling of the "Red velvet Chamber," which now, set apart for the Black Eagle order, leads into the former Chapel. At St. Louis, instead of the fireplace, this room contains a glass case in which are the principal pieces of plate presented to His Majesty the Emperor by a hundred towns on the occasion of his marriage in 1881.

No part of the internal decoration shows the fine traits of Schlüter's art better than this ceiling. Nowhere are the three sister arts more harmoniously combined: Architecture, which in bold perspective apparently carries the wall on into the ceiling, turns the stiff right angle into moving surfaces projecting pillars and concave circular niches; Painting which raises this airy architectural bas-relief scaffolding to the open-work centre, conjures classical deities into its interstices, and enwreathes the middle point with a row of figures; above all, Sculpture which assumes in stucco the most multiform shapes, from the bas-relief to the statue, from life size to miniature. Here one must acknowledge that Schlüter's fancy dominated all expressions of decorative art, and that in this whole work there is no line or form which had not his approval. The majority of them came doubtless from his own hand. It is also to be seen that plastic art was his chief talent. The great statues of ideal feminine forms and the hovering cherubs in the corners, the two oval medallions and the two winged figures under them, pleasing counterparts of the heads in the Charlottenburg guard-houses, all these bear testimony to Schlüter. But also in the wavy outlines of the balustrade bas-reliefs, and in the designs of their two center panels under those medallions, sculptural thoughts and technique prevail, as in all the ornamentation; the emblazoned cartouches, the winding volutes, the boldy formed vases, garlands, wreaths and shells, and the rich horizontal mouldings everywhere, all have the picturesque fullness of the Baroque forms, refined by plastic taste.

Its contents stand as a sign of the period during which flowery and pompous language, derived from antique and classical sources, was freely made use of. When a Prince was to be praised, he was called after the Olympian Divinities, and living powers were incorporated in the forms of classical myths. Thus the rotation of day and night is depicted in the large pictures of this ceiling by classical divinities. Aurora hovers before the rising sun, scattering roses, followed by torchbearing cherubs, while Luna opposite in the constellation of the Great Bear, threatens Mars and Venus with her bow and arrow; as a counterpart, Night appears with her sleeping children, then the dewy morning hour before the dawn, and Mercury beside Neptune, representing trade and navigation. In the rows round the center aperture are entwined Bacchantes, Fauns and Nymphs; in the midst of this lively dance a skeleton moves. In the bas-reliefs of the balustrade, troops of antique Gods and Goddesses are passing by. Culture wrested from the strife of the elements is symbolized by Neptune driving between river gods across the sea, Helios guiding his sun steeds, Cybele her lions, Diana her stags and Juno her peacocks; while Zeus, borne aloft on his eagle, hurls his thunderbolts against the shapes of darkness. Flora caresses Zephyr, and Apollo accompanies the Muses. These are repeated, wonderfully painted, as counterpieces to the Graces and Horæ, on the golden ground of the two square plaques. This world of figures is grouped together, however, only for the glory of the new king, for in the center picture jubilant cherubs crown his sign manual, while the geniuses on the balustrade bow over his escutcheon.

The artistic freshness of the whole is heightened by its execution. The urgent haste led to bold means being used. The prevalence of white or gilt stucco was conventional in rococo ceilings, as well as the imitation by painting instead of bas-reliefs; the realistic effect of paste-board and glass in the middle frieze is very original; glass-plates are fixed on the reddish dyed plaster, and on these figures cut out of gilt paste-board have been laid. The natural looking flowers springing from the corner vases are also made of paste-board, and many other pecularities of this work have made it a durable and festive monument. This ceiling was therefore all the more appropriate for the temporary State-building in St. Louis. It brings with it the full charm of Schlüter's art, which is here no less national than are the decorations of Le Brun in the palace of Versailles.

Schlüter's style also characterises the adjoining Gobelin saloon of the Berlin palace, and is continued in the reading-room on the ground floor, whose walls within their pilasters and niches have been copied from the so-called Swiss Gallery in Berlin.

The Restaurant connected with the principal building in the German State Building by a leafy walk, is also after Schlüter. Its pattern, taken from his last Berlin building, a villa in the Dorotheenstrasse, erected in 1712 for the Minister of State, Bogislaw von Kamecke, now the Club house of the Royal York Lodge of Freemasons; it is a graceful structure which appeals to those who enjoy material pleasures in a Restaurant. Here however only a few ideas have been borrowed from Schlüter's art, and indeed the fundamental design of this hall as well as its decorative variations have been freely invented. But German art as it is to-day, speaks from the historical part of the "German State Building." Even where this present-day art only faithfully copies, it joins its technical capability to that of the past where it works independently, but employs past styles, and endows them with new value. In these rooms Germans encounter welcome memories of historically well known forms.

The Great Elector has paved the way for them; they march forward through comparatively peaceful times, and are the first in the rude "Mark" to sun themselves in the beams of a refined civilisation and in the splendour of youthful majesty. It is significant that in Charlottenburg a royal lady took the lead. In the person of Sophie Charlotte rare contrasts are harmoniously combined to an unusual degree. She was beautiful enough to pass for the fairest of the fair with Peter the Great and the French ambassador, intellectual enough to inspire Leibnitz with his Theodicee and to give a pleasing turn to the rough jokes so much in vogue in her time. Her "Lützenburg" become a "Lustenburg;" and yet there amidst the gay festivities the plan matured to which the Academy of Arts and Sciences in Berlin owes its existence. She liked to live "sans façon," and was even called "la reine républicaine," but she was not averse to display when it imposed no constraint upon her. So did Sophie Charlotte shed the lustre of intellectual freedom and elegance over the ceremonial splendour of the Prussian crown, in accordance with the motto borne by a memorial coin of hers:

"Mon devoir fait mon plaisir."

These were also the sentiments of her princely consort. History placed Frederic I. between two truly soldierly men, who in their iron energy over-looked the attractive appearance of things. He loved the latter excessively, not only because it lay in his character, but also because the times demanded it of their princes, and because his country had become inclined for it. And that Frederic I. understood how to develop the idea of princely craft derived from the Court of Louis XIV. not only as being suited to his own wishes but also to the resources of his country, history has amply confirmed. His patronage of art raised industry and trade to a height proportionate to the existing international scale, and strengthened its international growth on native soil. Its lasting influence for improvement permeated all forms of life. And what Leibnitz did for the Queen, Schlüter did for Frederic I.; two German men whose names resound even to-day far beyond German borders.

The next period during which Prussian art flourished after Schlüter had passed away, came a century later under **Frederic the Great**. France too, and not the Mark was then its original abode, and yet it formed the most impressive decorations of the "German House" at the Paris International Exposition of 1900.

The importance of this "Friderician" art is however not due to the artists who shaped it, but to the king who stamped it by the greatness of his own personality with its chief historical features. Pesne's picture of him as a child is the only reminiscence of the monarch once styled "unparalleled," in the German State Building at St. Louis.

Two centuries have confirmed the significance of the Prussian sway for Germany for the existence of nations.

That which Frederic I. anticipated as a brilliant semblance has received a universal historical impress; on the tower of the Charlottenburg palace façade at St. Louis the German Imperial crown floats over the Prussian arms. Its present wearer, in desiring for this building the artistic style of the ages of his royal ancestor, did so with the joyful claim of an heir to his rightful privileges.

Alfred Gotthold Meyer.

Description of the German State building.

The representative building of the German Empire as well as the German Wine Restaurant have been built according to the plans of Professor Bruno Schmitz, of Charlottenburg; the local management of the building arrangements was entrusted to Herr Alexander Rudeloff, architect and during the further course of the work to Herr Wilhelm Brurein, architect. The erection of the building in the rough was carried out by Messrs. Boswau and Knauer Limtd. Berlin.

The main building covers an area of 930 sq. metres, is 46 metres long, and 21 metres wide; the ridge of the roof is 18 metres, and the topmost point of the figure on the tower 48·12 metres above the level of the terraces.

The ground-floor comprises a large reading room in addition to the circular entrance hall and various offices and exhibition rooms; the upper stories consist of reception rooms.

At the south end of the middle hall is situated the chief reception room, the "Oak Gallery," and adjoining it there are two smaller apartments, the "Galloon room" (Tressen-Saal) and the "Brandenburg Chamber." A door leads from the latter to another large apartment, in which the celebrated Berlin Gobelins from his Majesty the Emperor's collection are exhibited.

The main building is connected by an arboured walk with the German Wine Restaurant. This latter is 25 metres long, 19 metres wide and 15 metres high, and contains a total space, including cellarage, &c., of 6,246 cubic metres.

Special services have been rendered by the following firms who supplied fittings, &c., for the decoration and embellishment of the building, free of charge:

Julius Bluethner, of Leipsic, a grand piano in the upper hall; the "Bochumer Verein für Bergbau und Gussstahlfabrikation," cast steel bells in the tower; Hugo Bremer, of Neheim, "Bremer" lamps; the "Delmenhorster Linoleumfabrik," wall-hangings and floor-coverings; the "Deutsche Linoleum- und Wachstuch Co.," of Rixdorf, floor-coverings; the "Deutsche Steinindustrie-Aktiengesellschaft," a marble table in the entrance hall; H. C. E. Eggers & Co., of Hamburg-Eilbeck, the wrought bronze balustrade in the entrance hall; H. Frost & Söhne, illuminating fittings for the Brandenburg Chamber and the Gobelin Hall; August Gerber, of Cologne, 20 busts of celebrated German personages, and 12 busts of German Princes in the Oak Gallery; Gladenbecks Bronzegiesserei in Friedrichshagen, Inhaber Walter, Hermann und Alfred Gladenbeck, two cast bronze feet for flagstaffs, after designs of Prof. Chr. Behrens for the Friedrichsplatz at Mannheim; Rudolph Hertzog, of Berlin, all the window curtains, stores and lambrequins in the main building as well as the two large flags before it; the Königliche Porzellanmanufaktur of Berlin, different articles of porcelain in the reception rooms; the "Aktiengesellschaft Lauchhammer," of Lauchhammer, a fountain group "Abend," in the garden, designed by Prof. Kuno von Uechtritz; the Regina-Bogenlampenfabrik Cologne-Sülz, arc lamps; J. Rochlitz of Berlin, tower clock with automatic electrical winding apparatus; the Siemens-Schuckert Co. Ltd., of Berlin, electric search-light in the upper chamber of the tower; Villeroy and Boch, of Mettlach, the tiles of the verandah and terraces of the main building; Weber-Falckenberg, of Berlin, fireproof linen awnings in the arboured walk; W. Ziesch & Co., of Berlin, Gobelin coverings for the upholstered furniture manufactured by Kimbel & Friedrichsen of Berlin.

Lorenz.

GERMAN EDUCATIONAL MATTERS.

I. Introduction.

In order to understand and appreciate the peculiar character of German educational matters, we must not only consider their historical development, which took many hundreds of years, and the natural connection of all the various forms of education, but must also make ourselves familiar with everything connected with the study of teaching and learning. This cannot be realized at an international exposition, because, apart from the cost and range covered by such a representation, neither the actual instruction itself nor its historical development can be directly shown. However, according to the experience gained from the exhibition of German educational matters at Chicago in 1893, we may hope that it will be possible, within the given limits, to bring home to the large number of visitors to the Exhibition the forms taken by our educational system as a whole, as well as the methods employed and the results obtained thereby.

It is quite impossible to investigate this complicated system without the assistance of written works. An attempt has therefore been made for the first time by Prof. Lexis, of Gœttingen, with the co-operation of a number of professional men to set forth concisely in his book "Das Unterrichtswesen im Deutschen Reich," all branches of education as developed under the direction of the separate Federal States.

Accordingly the exhibits comprised at the Exhibition of German Education must only be taken as a selection of typical representations intended to symbolise German methods in their entirety. No sort of completeness could of course be aimed at, and it appears all the more justifiable to lay special stress upon a more thorough representation of particular branches than was done at the Exhibition of German Education at Chicago, in which, as many visitors to the present Exposition will remember, more care was taken to give a general idea of the whole than to go into a detailed consideration of separate branches of education.

The intimate connection of the various stages in the educational system from the Peoples' and Higher Schools to the Universities, Colleges and Schools for special branches of Technology, is of great importance for understanding German

methods. By means of the University and the colleges connected therewith,—which besides instruction also give opportunities for research,—German education is directed towards the highest aims of science. For this reason we must not omit to represent the German academies of science at the Exhibition among the principal types of our educational institutions as an embodiment of the organisation of scientific work. Foreign countries have constantly paid considerable attention to these academies as well as to German universities and technical colleges on account of their peculiar development and organisation. It is therefore natural that they too should be placed at the head of the following treatise.

It may be added that natural sciences and medical science with the educational establishments connected therewith, claim a far larger proportion of exhibits than the humane arts and sciences. The exhibition of the German Universities and Technical Colleges has therefore been obliged to keep the natural and medical sciences of Chemistry, Physics, Astronomy, Zoology, Botany, and Medicine distinctly view among the many branches of knowledge which fall within their domain. This is shown in the following special articles. Although, however, the humane sciences are apparently put in the back-ground of the German University exhibition, a glance at the collection of publications issued by German Academies which fills the "Ehrenhof" or "Court of Honour," dispels any impression that these branches of German Science are at all neglected or behind-hand. The specimens shown in the "Court of Honour," from the excavations at present being carried out by German scientists in the Saalburg, Babylon, Baalbeck, &c. and in no lesser degree the full-sized photographs serving for the purpose of instruction in artistic education, may be cited as proofs, in special branches, of our statement above. Here, too, however, full appreciation can only be gained by studying the comprehensive work regarding the German educational system previously mentioned. In this book the work of the German Universities in these branches is also thoroughly discussed, and all information desired in the other matters connected with our educational establishments can be gathered from it.

2. Universities, Technical Colleges and other Scientific Institutions.

A. General Survey.

a. Academies of Science and Universities within the German Empire.

The Universities of Germany do not merely serve for acquiring the highest education in scientific matters; they are at the same time centers for independent research. Their libraries, laboratories, collections, observatories, &c. are consequently not only fitted up to meet the requirements of students, but are intended to offer to instructors and young experimenters alike the means and assistance for furthering science in all its branches. This

sphere of university activity finds an important supplement in the work of the Academies, especially of learned societies which are organised and supported by the State, where the most prominent members of the particular sciences meet together. The Academies, as such, are neither instructional nor experimental institutions, but centers at which the results of research are collected; they are a powerful incentive to fresh experiment, and organise wide reaching undertakings which are beyond the power of a single individual; they also guarantee pecuniary assistance for carrying out expensive work, and render possible the publication of material which it would otherwise be extremely costly to make public.

The State Academies within the German Empire (the numberless private learned societies, some of which partly enjoy State support, do not come under consideration here) are all situated in University towns. They are intimately connected with these Universities owing to the fact that their ordinary members are for the most part professors at the University. In Berlin on the other hand, the ordinary members of the Academy have the right to deliver lectures at the University, even when they are not professors. The following is a list of the Academies:—In Prussia;—1. The Royal Academy of Science in Berlin, founded 1700. It has a physical-mathematical side and a philosophical-historical side numbering 60 members in all, as well as foreign, corresponding and honorary members. Its yearly expenditure, apart from the revenues from numerous bequests connected with the academy, amounts to 281,000 marks. 2. The Royal Society of Sciences, in Gœttingen, founded 1751, which has a philological-historical side and a mathematical-physical side, each consisting of 15 members, besides foreign, corresponding and honorary members. Annual revenue 27,600 marks.

In Bavaria: The Royal Academy of Sciences founded 1759, at Munich, comprising a philosophical-philological side, a mathematical-physical, and a historical side. Annual revenue 80,000 marks. In connection with the Academy is the General Conservatoire of State Scientific Collections, to which most institutions of the University belong.

In Saxony: The Royal Society of Sciences at Leipsic, founded 1846, with a mathematical-physical and a historical-philological side. It receives an annual State subsidy of 20,000 marks.

The immediate purpose of the Universities continues to be the giving of instruction in the sciences, although University professors are expected to contribute towards further progress in sciences. The learned professions for which they prepare according to old tradition, are Theology, Jurisprudence, and Medicine, and in these three branches instruction is given by the three corresponding faculties, which were once designated the "upper" faculties. Besides these there also exists, a philosophical faculty which originally in its calling of a Faculty of Arts (Artistenfakultät) had the task of preparing students for entrance to the upper faculties. At the present day, however, the range of learning of the philosophical faculty embraces the entire field of science which lies beyond the range of the above mentioned practical pro-

fessions. The philosophical faculty has also in turn become a preparatory institution for certain branches of the professions which have developed independently of recent years. Such, for example, as the callings of teachers in the higher schools, both of languages and mathematics, of mathematics and natural science, and of certain technical branches such as chemistry, agriculture, at some Universities forestry, and quite recently for professions requiring a special preliminary training, in political economy and science. Besides this, however, the students belonging to other faculties find in the philosophical faculty the necessary auxiliary scientific instruction for their profession or branch. Medical students in particular receive their training in natural science in this faculty. Owing to the unusually wide field covered by the philosophical faculty, one can understand how it is that where it has retained its wide scope it requires in itself the services of more professors than all the other faculties together. At some Universities, therefore, it has been considered desirable to split up this faculty into two branches, a historical-philosophical faculty and a mathematical-natural science faculty. The former has kept the title "philosophical." At other Universities two sections have been formed which have only certain points in common. In Tübingen there is also a special political-science faculty, and in Munich a special political-economic faculty.

The principal representative of the University is the Rector, who is elected to hold office for one year by the regular professors (at some Universities by the other professors as well). His appointment is subject to the sovereign's approval. The business of the various faculties is transacted by the Deans, who are also elected by the regular professors of each faculty to hold office for one year. The body of scientific instructors consists of regular professors, extraordinary professors and private tutors. Besides these there are the lecturers and assistants. The students matriculate at the University, and are enrolled in one of the faculties. Only those can obtain the full rights of matriculation who have as leaving certificates from one of the nine classes of higher educational establishment ("Gymnasium," "Real-Gymnasium," or "Upper-Realschule"). Foreigners have to produce a certificate of a corresponding standard. Students can also be enrolled in the philosophical faculty under rather less strict conditions by means of the so-called "small matriculation." Besides this certain branches admit "Listeners." Female students have up to the present been allowed to matriculate only at certain Universities, and then only provided that they have the proper certificate. The majority of Universities only admit them as listeners.

All the faculties confer the degree of doctor upon certain conditions, and the theological faculties also confer the lower degree of "Licentiate." The securing of such a degree is not, however, the practical aim of a person studying at a University, for there is no State privilege connected therewith. Besides the purely academical examinations for the degree of doctor, there are also State examinations for the principal professions, and ecclesiastical examinations for the theological faculty. To be admitted to the theological, legal, or higher grade teachers' examinations, it is necessary to be able to prove a

course of study of at least three years as a fully matriculated student. For the medical profession the period of study has been lengthened to five years.

The following is a list of the Universities within the German Empire. In Prussia: 1. Berlin, founded 1809; four faculties (theological faculty only Evangelical). 2. Bonn, founded 1818; five faculties (theological faculty Evangelical and Roman Catholic). 3. Breslau, originally founded 1702; refounded 1811; five faculties (an Evangelical and Roman Catholic theological faculty). 4. Gœttingen, founded 1737; four faculties (theological faculty only Evangelical). 5. Greifswald, founded 1456; four faculties (theological faculty only Evangelical). 6. Halle, (united with Wittenberg), founded 1694; four faculties (theological faculty only Evangelical). 7. Kiel, founded 1665; four faculties (theological faculty only Evangelical). 8. Königsberg, founded 1544; four faculties (theological faculty only Evangelical). 9. Marburg, founded 1527; four faculties (theological faculty only Evangelical). 10. Munster in Westphalia, founded as an Academy in 1771 and as University in 1902; four faculties (theological faculty only Roman Catholic).

In Bavaria: 1. Munich (originally in Landshut), refounded in 1829; five faculties (only a Roman Catholic theological faculty, and a special political science faculty). 2. Wurtzburg, founded 1582; four faculties (only Roman Catholic theological faculty). 3. Erlangen, founded 1743; four faculties (only Evangelical theological faculty).

In Saxony: Leipsic, founded 1409; four faculties (theological faculty only Evangelical).

In Wurtemberg: Tubingen, founded 1477; seven faculties (an Evangelical and Roman Catholic theological faculty, and special natural science and political science faculties).

In Baden: 1. Heidelberg, founded 1386; five faculties (theological faculty only Evangelical and a special natural science faculty). 2. Freiburg in Baden, founded 1457; four faculties (only Roman Catholic theological faculty).

In Hessen: Giessen, founded 1607; four faculties (only Evangelical theological faculty).

In Mecklenburg-Schwerin: Rostock, founded 1419; four faculties (only Evangelical theological faculty).

In Saxe-Weimar: Jena (supported partly by the three Duchies of Saxony), founded 1558; four faculties (only Evangelical theological faculty).

In Alsace-Lorraine: Strassburg, founded in its present form in 1872; six faculties (an Evangelical and Roman Catholic faculty and a special mathematical natural science faculty).

Besides these, there are in Prussia the Lyceum-Horianum in Braunsberg for the education of Roman Catholic Theologians which ranks officially with the Universities.

In Bavaria there are eight Lyceums which were founded for the same purpose. In Prussia there are, moreover, six training colleges for Roman Catholic theological students, and one in Alsace-Lorraine and Hessen.

Dr. Lexis.

b. The Technical High Schools of the German Empire.

The rise of the Technical High Schools of Germany.

In 1813 and 1815, after the struggles from which the German States had regained their independence, the economical condition of Germany, in consequence of the stormy times of the devastating Napoleonic Wars had fallen to the lowest ebb. In England at the same time the steam-engine had begun its triumphal progress by opening up that countrys' riches of iron and coal. At that time the German States had only a thin population, which, owing to the undeveloped state of commercial industry, derived a naturally limited income from agricultural pursuits.

It was recognised that Germany was only to be economically raised by the expansion of her industrial activity. Two ways led to this end,—the practical, taken by pioneers like Krupp, Siemens, and Borsig, working quietly but uninterruptedly to replace the former handicrafts by an organised industry, and the theoretical way adopted by the Governments, of placing industry on a scientific basis by the erection of Technical Schools. That permanent progress in competition with other countries could only be made on such a foundation is proved by the recent developments in technical chemistry and electricity and heat-engines in Germany.

The beginnings of the German Technical High Schools were not surrounded by the festive splendour which shed such bright light on the founding of the Universities. Almost all the Technical Schools out of which the present Technical High Schools have risen were originally Middle-class Schools; and only when they had by continuous effort gained an important position, did they obtain the charter of a High School in the second half of the nineteenth century. The accompanying sketch represents better than words the course of the development of the High School. The origin of the High School in Berlin is marked by the fact that it grew out of the union of the Architectural School (founded 1799) and the Commercial Academy (1821).

Aim of the Technical High Schools.

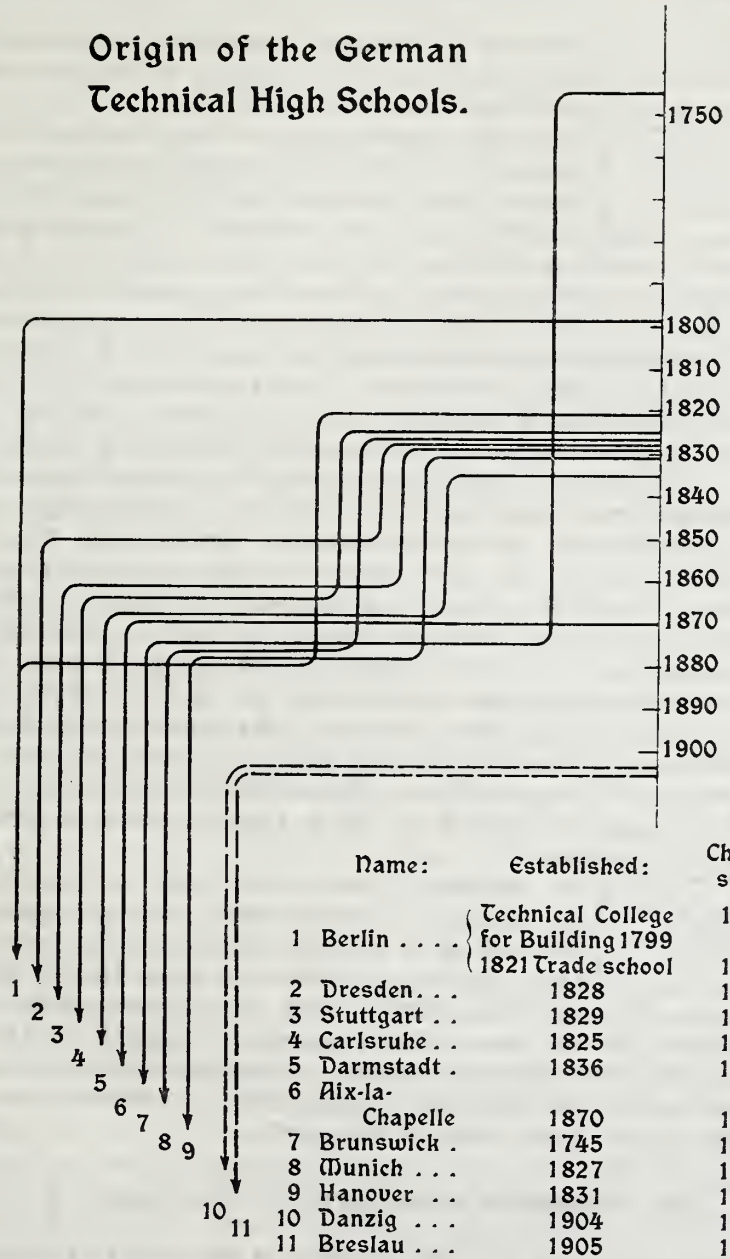
This aim is clearly expressed in the first sentence of the constitutional statutes of the Technical High School in Berlin: "The aim of the Technical High School is to afford a higher education for the technical professions in the civil and public service and in commercial undertakings, as well as to cultivate Arts and Sciences in so far as they come under the head of Technical Instruction."

Both teaching and independent scientific research are therefore aimed at; the lecture-theaters, drawing-halls and laboratories serve for teaching purposes, while in the laboratories scientific research is also prosecuted.

Organisation of the Technical High Schools.

Each Technical High School has departments for separate studies, and in each are divisions for architecture, building construction, engineering, chemistry and mining, natural sciences and mathematics. Besides these some schools have special departments, as Berlin and Danzig for ship-

Origin of the German Technical High Schools.



	Name:	Established:	Charter since:
1	Berlin	Technical College for Building 1799	1799
		1821 Trade school	1879
2	Dresden . . .	1828	1851
3	Stuttgart . .	1829	1862
4	Carlsruhe . .	1825	1865
5	Darmstadt .	1836	1868
6	Aix-la-Chapelle	1870	1870
7	Brunswick .	1745	1877
8	Munich . . .	1827	1877
9	Hanover . .	1831	1879
10	Danzig . . .	1904	1904
11	Breslau . . .	1905	1905

-building, Karlsruhe for forestry, Munich for agriculture, and Brunswick for pharmacy.

The division into separate departments guarantees a greater thoroughness of instruction, while the union of the Heads of Departments in the Senate secures a united intellectual aim.

New Regulations during the last ten years.

The sudden development of technology has rendered new and comprehensive regulations necessary in every branch: they can only be slightly sketched here. In architecture, the founding of special professorial chairs for town building, partly to meet the advanced technical demands for town buildings, and also to secure that the long neglected artistic point of view should be kept in mind when building not only a single edifice, but a whole city. The erection of conservatories for ornamental botany is specially taught in Berlin and Danzig. In building construction and engineering: introduction of laboratory instruction, opening of laboratories for hydrotechnics, for iron constructions and measurements of earth pressure, Dresden and Berlin. In Machine Construction: the fitting up of laboratories for the same and of large electro-technical Institutes. The building of testing stations for water-power hydraulic machines, needed from the rapid increase of late in the use of water-power, Dresden, Darmstadt and Berlin. Ship-building: the fitting out of an extensive establishment for testing the resistance of models of ships by towing, in Berlin. Chemistry and mining: development of electric chemistry, in Aix-la-Chapelle. The preparation of more thorough expert instruction for working mines and treatment of iron. Technical Administration: the giving of special instruction to such engineers as intend to take over the management of large technical works or communal stewardships. A comprehensive technical education forms the foundation in these cases, while a special study is made of law and administrative science.

Exhibition of the Technical High Schools.

An Exhibition can only be made of the form, not of the contents of instruction. The photographs taken of work done in the laboratories, as represented in some pictures, give only a faint idea of the restless activity pulsating through these places. One cannot measure the results of the instruction by drawn plans; this can only be gauged by what former students, now practical engineers, create in practical life as the outcome of the intellectual nature of their instruction. What is exhibited must then be looked on only as the outer shell of this work. Kammerer.

B. Scientific Chemistry in Germany.

The amount of work done in Germany in the field of chemical science and technology is enormous, but the great results which have been and are being daily attained by the latter are principally due to the fact that technology is most intimately by-related to science. Science can dispense with

technology, although at the moment it derives great help from it, but the technology of the present day is inconceivable without science. Many years passed before the efforts of Liebig, the founder of modern chemical research and instruction as it exists in Germany to-day, called into being a sudden practical growth of the industries, and since then the industries have been constantly gaining incentive and assistance from the progress of science. The chemical industry engages in its works and laboratories the services of a great number of highly trained chemists, whose business is to examine scientific discoveries as to their technical value and turn them to account industrially.

The development of this industry is, therefore, entirely dependent upon the excellence of the seats of learning. This being so, we will give our attention for a moment to their organisation throughout Germany.

Chemical Instruction.

Chemistry is taught at every university and technical college, at a number of mining academies, agricultural colleges and schools of forestry. There are also special schools which give instruction in such particular branches of chemistry or chemical technology as dyeing, ceramics, and fermentation.

The division of the instruction and course of study in chemistry is very similar at the Universities and Polytechnics. They are still principally based upon the well tried methods of Liebig. Preparatory instruction in chemistry is not made a condition for commencing study at any of the colleges, for at most German Grammar schools this science is only taught in most elementary form.

The course of instruction commences by the novice becoming acquainted with the general reactions of different substances, and then with qualitative and quantitative analysis, and volumetric analysis of gases. As a rule four "semesters" (2 years) are spent in learning these subjects. The student then goes from the inorganic to the organic department of the laboratory, where he spends one or two "semesters" in becoming an adept in making organic preparations and in the analysis of organic substances. This concludes the actual training of the student for a chemist. In the majority of cases, however, the young chemist undertakes the writing of a scientific treatise for the purpose of securing a doctorate. The theme of his treatise is selected for him by one of the professors under whose guidance he has to carry out the work. Besides doing all this practical work in the laboratory, the student is also bound to attend a number of lectures delivered by the professors.

The directors of nearly all the laboratories in German colleges have formed themselves into a Union, the aim of which is to regulate the chemical instruction throughout the country upon a standard system. In order to put this into effect, an examination, the so-called Union Examination, has been instituted for students; it is held after the 4th–6th semester, and in it the student is required to show a knowledge of general and inorganic analysis, and analytical and organic chemistry.

Chemical Research.

Closely connected with this course of instruction is the free, independent research of the tutors at the colleges. To-day, just as formerly, it is considered indispensible

that the professor should perform research work, for it is assumed that only by this means will he be able to stimulate the younger generation by his example, and at the same time teach them to exercise their inventive faculties. This successful two-fold activity of research and instruction forms the basis of the development of German chemistry. We will now turn to the most recent results achieved by chemical research, particularly in connection with the chemical department of the Education Exhibition.

Universal Chemistry.

Universal chemistry has made enormous strides owing to the activity of physico-chemical research. Experimental research as to the general properties of matter, especially those of dilute solutions, has presented science with a bounteous store of fruitful material. Owing to J. H. van't Hoff's pioneer labours, which began in the year 1885, it has been discovered that the state of a substance in dilute solutions is similar to the gaseous state, and that Boyle's and Gay Lussac's law of gases, as well as what is known as Avogadro's Law, also hold good for dilute solutions if osmotic pressure is substituted for gaseous pressure. Research work in the physiology of plants, such as that of Traube, de Vries, and particularly Pfeffer, offered an inducement to a closer investigation of osmotic pressure, which Pfeffer succeded in actually measuring in his clay cell provided with a diaphragm of copper ferrocyanide. According to his experiments it is found that dissolved substances exert the same osmotic pressure in solution as they would do in a gaseous state at the same temperature and in the same volume.

One result of this theory was the conception of a new method of determining molecular weights by lowering the freezing point and raising the boiling point (Raoult's and Beckmann's methods).

Whilst the properties of the atom and molecule in solution were being thus studied, the further development of the methods hit upon by Victor Meyer, performed by means of displacement of air, rendered it possible determine the molecular weights at extreme temperatures, (H. Biltz) and gave a natural explanation for phenomena which had hitherto been considered inexplicable. This method has been carried still further by Nernst, who determined the vapour density of metals by using an iridium bulb and an electrically heated furnace, while for weighing very minute quantities of metals it was necessary to use an extremely sensitive balance constructed of fine quartz filaments.

With the help of these various discoveries the theories of the dissociation of gases and of the electrolytical dissociation of salts in solution were further developed. All methods based upon the theory of osmotic pressure pointed with quantitative uniformity to the fact that this is greater in aqueous solutions than the pressure calculated from the molecular weight of the substances as determined by other methods. It followed therefore that these substances when dissolved in water were in a different molecular state, that is to say, they must be more or less split up or dissociated.

Since just those substances which in aqueous solution are able to conduct the electric current, (i. e., the electrolytes) are under a considerably higher osmotic pressure than is to be expected from their molecular weight in the gaseous state and from their concentration, and since, these same substances lose the property of conducting electricity to any appreciable extent when dissolved in other solvents and at the same time cease to exhibit abnormal osmotic pressures, it follows that the splitting up of the substances in aqueous solutions is closely related to the conductivity of the electrolytes. This fact which was established principally by Kohlrausch, Hittorf, Ostwald, Planck, van't Hoff and many others, led to the development of the theory of ions and to the establishment of the laws of electrolysis by the Swedish scientist Svante Arrhenius. It would carry us too far if we were to enumerate and treat fully of all the numerous results achieved for general chemistry from these laws.

The question as to the nature of the forces which come into play in a chemical combination or reaction was asked long before a science of chemistry existed, and the question has not even yet been finally solved; nevertheless the manner of operation of these forces, their dependence upon such external conditions as mass, temperature, and pressure, has been investigated with undoubted success. The results of these investigations are the law of the effect of mass and the theory of chemical equilibrium, Chemical Statics. The scientific explanation furnished of the formation of ocean salt beds by van't Hoff and Meyerhoffer are one of its practical results. Out of all the results and successes which theoretical research has showered upon us, we will only mention the valuable discoveries which have been made in thermo-chemistry and electro-chemistry. Any change produced on passing an electric current through a compound body is called electrolysis, as far as electricity itself exerts its influence (Faraday, 1837). The practical application of this process is the separation of metals from their solutions (quantitative analysis by means of electrolysis was especially perfected by A. Claassen) or from their molten salts (calcium production (Borchers and Ruff)). Electrolytic reduction and electrosynthesis (Elbs and Tafel) are successful achievements in this field of research. The further perfection of electro-chemical science has completely cleared up the subject of the production of electric energy by chemical systems, and the thermodynamic theory of electro-chemical processes has advanced so for that we can calculate the electromotive force of numerous galvanic combinations (Nernst). Electrical methods are also often of value for characterizing chemical preparations (Abegg, Bredig and Drude).

Inorganic Chemistry.

Great activity is again being displayed in the field of inorganic chemistry, which, since the epoch making discoveries of germanium of the hydrogen compounds of the metals of the alkali and of rare earth groups by Clemens Winkler (discoveries which were of much importance in developing Mendelejeff's system) had been forced into the background by the signal advances of organic

chemistry. By using high and low temperatures, high and low pressures, liquid air (Linde), and the electric furnace (Borchers), it has become possible to attain quite new effects. We may here mention the operations which use liquid ammonia as a solvent (Stock) and the synthesis of certain natural iron ores by using pressure (Ruff).

Organic Chemistry. As already pointed out, the latter part of the past century stands almost entirely under the spell of the splendid developments of organic chemistry.

Hydrogen peroxide has been obtained in a crystalline form (Städel and Wolffenstein). The conditions of generation, the properties and the effect of ozone have been exactly investigated (Ladenburg, Nernst and Harries). The preparation of the colloidal metals and metallic oxides has been made a special study of by Pahl. Our knowledge of the properties of the rare metals and earths has been extended (crystalline Zirconium (Wedekind)). The chemistry of complex compounds has been considerably enriched (Rosenheim, Weinland and Grossmann, amongst others). The greatest success, however, has been attained by the study of contact-substances, such as finely divided platinum (platinum-sponge), the peculiar effect of which upon a mixture of gases was first discovered by Doebereiner and applied in his gas igniter. Clemens Winkler worked out the sulphuric acid contact-progress, which consists in combining sulfurous acid and oxygen to form sulphur trioxide by means of platinised asbestos, which resulted in a complete revolution in the manufacture of sulphuric acid (Knietsch). By a scientific treatment of this problem Engler and Lothar Wöhler have made it apparent that the property of platinum sponge of combining hydrogen and oxygen depends upon the absorption of oxygen (auto-oxydation) by the platinum sponge, whereby a peroxide of platinum is formed which ignites the hydrogen impinging upon it.

Analytical chemistry has experienced extension in many respects, and the analysis of gases has been brought to its highest point by means of the apparatus of Hempel, Cl. Winkler, O. Brunck, Bunte, J. Fischer, and Wohl.

The unprecedented successes of A. W. von Hofmann in the field of coal-tar dye-stuffs drew the general attention of chemists to purely synthetical work, and the original problems of Liebig, the investigation of the composition of natural and physiological substances, no longer held the field. With the ever increasing clearness given to the theory of the constitution of organic compounds and their laws of substitution, which reached a climax in the establishment of the formula of benzol by August Kekulé, synthetical work became more and more successful. One might have thought that synthetical chemistry had reached its highest point when Engler and Adolf von Baeyer produced indigo by artificial means, whilst Graebe and Liebermann did the same with alizarine, and Emil and Otto Fischer with rosaniline, and when the discovery of phenylhydrazine by Emil Fischer opened new paths of investigation in the chemistry of nitrogen, which led to the discoveries of free hydrazine and hydric nitride by Theodor Curtius,

and amidoguanidine by Johannes Thiele. But the victorious path of research did not stop here, but turned to attempt problems full of mystery, the treatment of which appeared far more difficult than any of those hitherto solved. The synthesis of sugar and the theoretical researches on the subject by Emil Fischer (and by Wohl, Ruff, Tollens, and Thierfelder) is the most brilliant confirmation of van't Hoff's stereo-chemical of unsymmetrical carbon atoms. The syntheses of uric acid, xanthine, theobromine, and caffeine by Emil Fischer, Robert Behrend and Wilhelm Traube, form the return to the problems of Liebig and their solution. The investigation and synthesis of the terpenes and camphors, the ethereal oils and artifical aromatic substances by Wallach, Tiemann, von Baeyer, Bredt, Beckmann and others, formed quite a new branch of organic chemistry, the hydro-aromatic branch. Yet another new field is opened by the heterocyclical combinations (Ladenburg, Knorr, Dennstaedt, Gabriel, Doebner, Busch, Stoer and others), which are closely related to the alkaloids. The explanation of the constitution, the decomposition and synthesis of these complicated alkaloids, of coniine (Hofmann and Ladenburg) of narcotine and hydrastine (Roser, Freund and Fritsch), of atropine and the cocaine alkaloids (Ladenburg, Liebermann, Merling and Willstätter), of nicotine (Pinner), of morphine and thebain (Vongerichten, Knorr, Pschorr and Freund), and of quinine (von Miller and Rhode) form pages of glory in the history of German Chemistry, and excite the greatest admiration for the discoverers.

Physiological chemistry and fermentation.

Great work has been done here, though there are still more difficult, if less inviting, problems yet to be worked out in the chemistry of the amorphous and colloidal natural products, of cellulose (Alexander Mitscherlich, König, Wolffenstein) of caoutchouc and guttapercha, which possess such great value for technological purposes, and, more important than all, the chemistry of vegetable and animal albumen (Emil Fischer), of the colouring matters in the blood (William Küster) and of the digestive juices (Thierfelder, Kutscher, Siegfried, Salkowski, Fromm and Neuberg), all of which problems still have to be finally solved, for only when a knowledge of them has been obtained can a really scientific system of Medicine be built up. Physiological chemistry and organic chemistry are becoming ever more closely connected, especially since the introduction of pure cultivations of microbes, the chemical effects of which have been studied in many hundred different kinds of cases (Delbrück, Emmerling and Lindner).

In the chemistry of fermentation there were until recently two principal views held,—Liebig maintained that the process of fermentation was a chemical one, whereas Pasteur held that it was biological. The experiments made by Edward Buchner have now confirmed Liebig's view, for he has proved that pressed yeast-juice (the zymase) which contains no cell-substance (plasma) is capable of producing fermentation in exactly the same way as living yeast.

Dr. Harries.

C. Physics and kindred Sciences.

("Scientific Instrument" Group.)

During the eighties of the last century the opinion was often to be heard expressed, even in professional circles, that the science of physics might be compared to a structure which had been brought nearly to completion by masters such as Helmholtz and Lord Kelvin, and which offered science sufficient room for many years to come; it was thought that now it could only be a question of harmoniously fitting out the structure by working diligently at the details. To-day every one recognizes how erroneous that opinion was. As a matter of fact we can look back upon a development during the last ten years which will ever be remembered in the history of the exact sciences.

The movement was set on foot in Germany by Heinrich Hertz. Upon the early and much to be lamented death of this scientist, his teacher Helmholtz wrote: "In ancient classic times one would have said he had been sacrificed to the envy of the gods."

Unfortunately but a few months after the death of his great pupil the master himself followed; it was not granted him to live to experience the discovery of Röntgen, led up to by Lenard and others.

It is still in the memory of every one how much stir was caused by the discovery of the Röntgen rays in consequence of their immediate importance for medical diagnosis and research. A circumstance of far greater importance for the science of physics was, that within a remarkably short period it led to discoveries and work of the foremost importance by physicists of all civilized countries. We need here only mention the names of Becquerel, Curie, J. J. Thomson, Ramsay, Elster and Geitel. The importance of these scientists' discoveries will be better appreciated when we say that they have completely changed our previously held conceptions of the nature of matter. Another standard by which to gauge their importance is offered by the large amount of assistance and incentive they have given during the last ten years to kindred sciences such as meteorology and astronomy, chemistry and medicine.

This active mutual influence of the sciences, from which physics in turn have derived great benefit, may be designated as a characteristic feature of the evolution of the exact sciences during the last few decades. To keep to the simile already adopted, it has been found necessary to make very considerable additions to the structure of physics, and the same is true of the kindred sciences. These extensions have chiefly been the work of the physical institutes of our Universities and Colleges. The perfection of the older portions of the structure has, however, also made great advances, and an important share has fallen to the lot of those state institutions of Germany which are distinct from the universities.

Work in newly opened fields of research requires but simple aids, but as soon as it is a question of working out methods already known and of

extensive systematic investigations with the aim of ascertaining as accurately as possible the relations in figures in a certain field which measurable quantities bear to one another, the matter is different. Such work cannot as a rule be undertaken by the laboratories and observatories of our colleges, either because the investigations cost too much, or because the all-important duties of the professors as tutors do not leave them time enough to commence making calculations which may last some years, and often require the co-operation of several persons.

Since the foundation of the German Empire, a number of state scientific institutions have been founded, chiefly in the kindred sciences of physics, and already existing ones have been extended. Such are the Imperial Standard gauging Commission at Charlottenburg and the Royal Prussian Scientific Observatories at Berlin and Potsdam (Astrophysical Observatory, Meteorological and Magnetic Observatory, and the Geodetic Institute). In the field of physics Germany was the first country to establish an Imperial Physical Technical Institute. This it did at the end of the eighties at Charlottenburg. This Institution, at first under the guidance of Helmholtz and at present under that of Kohlrausch, developed an unusually beneficial activity, and large state institutions have been founded by England, America and France during recent years after the pattern of the Imperial Institution. Other countries are content for the present to establish state laboratories whose task is to work out problems in fields of special importance (electricity, for example), which in Germany fall to the lot of the Imperial Institution.

After these preliminary observations we may pass on to the considerations which have determined the system of organisation of the "Scientific Instrument" Group.

It is not the first time that Germany has shown a collection of scientific instruments at an international Exposition in the United States. At the Chicago Exhibition of 1893 the instruments of a great number of branches of the mathematical and natural sciences in the "German University Exhibition" were displayed.

At that time special importance was attached to showing historically interesting apparatus and original constructions of the instruments with which German scientists had made important or memorable advances in the exact sciences. It will suffice to recall the air pump of Otto von Guericke in the field of physics, the instruments of Gauss and Weber, Kirchhoff's spectral apparatus, and the instruments of Helmholtz. Quite apart from this portion of the University Exhibition, the German Society for Mechanics and Optics had collected together a considerable display of scientific instruments, which bore conclusive testimony to the strides made by German instruments of precision during the last decades of the past century.

In making preparations for the present Exhibition it was decided to avoid a repetition of the display made at Chicago, and not to emphasize the historical standpoint in the field of physics and the kindred sciences. It was also decided not to make a systematic demonstration in the group now under

consideration of the scientific advances made in Germany during the last ten years by means of the instruments used by our scientists. For in many cases it happens that the apparatuses in question are being at the moment employed in other investigations, or that they have already been altered for use in other kinds of work.

It was therefore decided that the German industry of instruments of precision and optical apparatus should be asked to display in the German Educational Exhibition the instruments and apparatus made for the sciences of astronomy and geodesy, meteorology, and pure and applied physics. Special attention was to be paid to the display of the more precise measuring instruments.

Although numerous instrument works have acceded to this request with the most praiseworthy readiness, it is at the same time natural that the exhibition cannot be complete. By no means is every leading instrument works represented, and the exhibits offered often fail to give an idea of the diversity of objects turned out by one firm. It is just the most expensive productions of the industry of instruments of precision, which are only manufactured to order, and which are rarely at disposal for exhibition purposes. Most of the scientific institutions which possess them cannot spare them for such a long time. The transport of such delicate instruments too, especially for long distances, is open to considerable objections. If in spite of this a great number of the most beautiful instruments are exhibited at St. Louis, it has only been possible to do so through the generous support offered by the Imperial and State authorities.

The group "Scientific Instruments" is divided into four departments resembling laboratories, and designated A–D. They are Astronomy, Geodesy, and Metrology (A), Optics (B), Electricity (C), and Thermometry and Meteorology (D). Besides the precise measuring instruments and devices which serve purely for scientific purposes, there are also exhibited, in the rooms C and D particularly, apparatuses for scientific technical investigations.

Scientific glass instruments of precision are closely connected with Thermometry. These are exhibited by numerous firms in room D. In the province of meteorology, investigations of the atmosphere have made great strides during the last few decades. These are represented by the exhibits of the Aeronautical Observatory at Berlin, which is connected with the Royal Meteorological Institute. Attention may be further called to some cases filled with demonstration apparatuses and contrivances employed for purposes of instruction at our Universities and Technical colleges, and in particular to two large projection apparatuses which are set up in the lecture hall adjoining the group. The lecture hall itself also demands attention as being typical of similar auditoriums at our colleges. It is intended to employ the hall for delivering lectures, preferably on subjects connected with the group, and amongst others on the subject of ocular photography.

The specialist will find a more detailed description of the contents of this exhibition in the introduction to the special catalogue of the group

"Scientific instruments." It would have been difficult to sharply distinguish this from other groups of the comprehensive Educational Exhibition, and no attempt has been made to do so. In order to get a concise idea of the work done by Germany in the manufacture of scientific instruments, attention should also be paid to the exhibits in other German departments, particularly the "Chemistry" and "Medicine" sections of the Educational Exhibition.

The careful observer of these exhibits will be confronted at every turn by the close connection and constant interaction between science and technology. We need only mention the incentive which is constantly being given to the technology of precision by the above mentioned scientific State Institutes as well as by the numerous Institutes in the Universities and Technical Colleges. On the other hand some of the firms exhibiting in the group bear testimony to the great assistance rendered to science itself, owing to such undertakings being carried on in a thoroughly scientific spirit.

It is to be hoped that the exhibition of scientific instruments at the German Educational Exhibition at St. Louis of 1904 will have many points of novelty even for the observer who has carefully studied this branch of German industry at Paris in 1900, and that it will confirm the impression that German science and technology in this important branch are progressing satisfactorily.

Dr. Lindeck.

D. Biology: Zoology and Botany.

a. Zoological (Biological) Museums in Germany.

The principal aim of Biological Museums should be to awaken not only an appreciation of nature and of a natural and healthful manner of living, but also to bring home to every individual the fact that life follows certain fixed laws which can be determined with just as much certainty for the bird of the air as for the fish in the lake or river and for the medusa in the sea, and that man can only break these laws at the expense of his health and working capabilities. The large biological museums have other aims, which are however of secondary importance. These are to arouse a pleasure in nature and in the beauty and diversity of her products, to awaken an understanding for the structure of the various organisms and their adaptations, to increase the knowledge of mankind with regard to animate creatures, whether useful or harmful to his well-being, and, last but not least, to assist in the building up of the biological sciences.

This is an extensive programme, and we readily admit that up to the present no German museum has proved fully equal to the task in every respect; but strenuous efforts to this end are being made in all directions, by this museum in one way, by that in another, for it is often the case that the means and assistance at hand necessitate a judicious limitation to particular fields of study.

Since the objects of nature are insufficient in themselves to demonstrate directly to the uninitiated the fundamental laws of physiology, and since long explanations are seldom read, many museums have drawn up guides in which a specialist has collected the available material into a connected essay, endeavouring at the same time make it more comprehensible by means of a system of questions and answers. For a number of years past the Berlin Central Establishment for the welfare of Working Men has taken up the organisation of such guides for workmen. The result in almost every case has been entirely satisfactory. These guides are the best means of gradually increasing the number of visitors to a museum. Some of the more recent museums (Bremen and Altona) have in addition a special lecture hall and a reading room, both open to the public; while in Altona popular lectures are delivered with lime-light views on objects in the museum. In connection with the Museum for Marine Science now being established at the University of Berlin, popular scientific lectures have been introduced for some three years past, the exhibits in the museum being much employed for the purposes of explanation. These lectures have been well attended. The subjects chosen are various branches of marine research, and often deal with the biology of marine organisms. Lectures with lime-light views are accompanied by the great disadvantage that those who attend them are unable to make any notes in the darkened room, and what they hear may thus be easily forgotten again. In Altona this difficulty has been overcome by the lecturers sending short extracts of their lectures beforehand to be printed in a local paper, the paper supplying in exchange a number of copies free of cost.

All the larger biological museums have issued catalogues which take into account the requirements of the average visitor, and are edited accordingly. They are also sometimes illustrated.

Next to the objects themselves, the labels attached to them are the most important part of a museum, for they have as a rule to take the place of a spoken explanation. Many museums adopt the good plan of printing short general explanations which can be quickly read, and more detailed explanations of the objects of particular interest. The museum of natural science at Berlin, as well as other museums, uses in many instances geographical labels upon which the district where the exhibit is found is marked in red on a small chart of the world, as well as any localities where it appears in various geological strata.

Biological museums in Germany are principally of a zoological character, since the preservation of plants in a manner true to nature is accompanied by considerable difficulties. As a substitute we find in many of the larger towns botanical gardens containing extensive collections of living plants. In all the larger museums, too, there are botanical departments with comprehensive collections of plants for the use of specialists, whilst some of the dried plants, such as the specimens of woods and seeds, are also open to the inspection of the public.

Biological museums may be divided up into three groups, according to size and the class of people who visit them.

1. General museums or People's Museums, which aim at cultivating all branches of Biology, and often give special attention to special branches such as commercial geography, knowledge of mercantile wares, raw products and the various forms in which they are industrially employed. This class of museum is naturally only found in the larger towns, for they cost considerable sums to establish and keep up. The largest museum of the kind in Germany is the Natural History Museum in Berlin. The second place is held by the Hamburg Natural History Museum. Other important museums of this class are those of Bremen, Frankfort-on-the-Main, Stuttgart, Dresden and Carlsruhe.

2. Provincial museums. These are of the same character as the general museums, but their programme is somewhat more restricted. Their chief aim is to give full consideration to the interests of their particular districts. Thus the West Prussian Provincial Museum at Danzig makes a point of carefully collecting animal and vegetable fossil remains that are found in amber, as well as the prehistoric urns and utensils which are found in such numbers in that province. The Altona Provincial Museum, which exhibits the animal and vegetable world of the district in splendid biological groups, is an excellent representative of this type. The artistic treasures of the country are also very cleverly displayed there on the same principle; we see the Holstein peasants sitting around the wide wooden table in their becoming costumes, and in the hall, the walls of which are decorated with Dutch tiles, we see the housewife busy with her duties about the old-fashioned hearth.

3. Museums of the Biological Institutions at Colleges, Universities, Agricultural Schools and Academies of Forestry. The principal purpose of this class of museum is instruction, and it is this which gives them their special form. The University museums for example show a preference for anatomical and embryological slides and models rather than for a systematic collection. The most important of these museums, such as those at Munich, Breslau, Bonn and Tübingen, make a practice of admitting the public on certain days of the week.

In the course of the following remarks only the zoological collections are referred to. The botanical collections, for the reasons mentioned above, are of considerably less extent and importance. The tendency is becoming more and more marked to divide the objects collected into two classes, a show collection likely to interest the general public, and a scientific collection to which only scientists and students are admitted. At the Natural History Museums in Berlin and Hamburg this principle has been fully carried out, whilst other museums have only followed it partially, some more, some less. The advantages of adopting the system is clear. For the exhibition the best objects are carefully selected,—non multa, sed multum. Visitors should not be obliged to wander through endless rows of stuffed birds, cases of insects or jars of spirits, but should only be shown the

most important objects; these, however, must be faultlessly arranged and explained, so that they are attractive to the eye and at the same time instructive to the mind. All objects which are not suitable for this part of the museum are collected and set aside for examination in the scientific collection. Three important factors must be considered in order to render the collections of all larger museums attractive to the general public: the rooms must be as well lighted as possible, the objects must be presented to view in faultless cases, and sufficient opportunity must be given to visitors to rest a while upon comfortable benches. This last point is unfortunately neglected in most museums, in spite of its being a well known fact that visiting a large collection is very tiring and occasions as much mental strain as physical. If one returns home exhausted after visiting a museum, one has no inclination to repeat the visit.

The question of light is one of the most difficult problems to solve in connection with museums. It has but too often happened that the architect from artistic considerations has made the windows too small, and this considerably reduces the value of the whole building. The Altona and Bremen museums testify to the fact that even in buildings of considerable size the lighting may be satisfactory throughout, provided the buildings stand quite alone. If the windows are made high and broad, and if no cases are arranged against the exterior wall, then as a rule all the objects exhibited will receive sufficient light. In the new building at present in course of construction for the Darmstadt Natural History Museum, Prof. G. von Koch has hit upon novel and excellent method of lighting for the large animal geographical group which occupies a surface area of 20 square metres or more. The arrangement is similar to that of an aquarium where the visitor finds himself in semi-darkness while the greatest amount of light falls obliquely from above upon the vessels of water and other objects. It cannot be denied that every object obtains a sufficient amount of light by this means, whilst the visitor himself is surrounded by a pleasant semi-darkness.

In the matter of exhibit cases, the Dresden museum undoubtedly holds the foremost place in Germany. The more recent museums one and all favour the substitution of iron cases for wooden ones, although they are more expensive; the advantages are, however, so great that the cost ought not to be considered. They can be made almost absolutely dust-tight, of infinite durability, and the parts necessary for fixing glass panes can be reduced in size to a minimum, so that they permit of the greatest possible clearness and the best utilization of space. The larger the panes of glass in front of the case, the more attractive to the eye the latter becomes. In Dresden there are some very high and broad sample cases which are set on rollers and can consequently be easily shifted. Their huge doors can be opened and shut with the greatest ease.

In the best modern constructions all locks and hinges are arranged inside, so that nothing can be seen but smooth narrow strips of iron. Within the cases the objects are placed upon glass plates which can be ad-

justed to any desired height. In most museums the cases are painted dark on the outside, black, with a suggestion of blue or green. Opinions held by German specialists as to what the inside colour should be, vary very considerably. In the large Berlin museum Geh. Reg.-Rat Möbius chose a light yellow shade for all the cases, as well as for the mounts and supports of all the objects exhibited, and for the labels and notices. There is no doubt that this sand or khaki colour has its advantages for many objects. Brown or any dark coloured birds or mammals stand out splendidly against this background. For corals and skeletons a dark background is most suitable. If a case containing jars of objects preserved in spirits stands in a corner where it gets little light, the objects should be made to stand out more clearly by using a dazzling white paint. In Dresden light green and light blue shades have also been used with success. The old rule holds good in this that one ought not to adhere to one principle, but that the colour should be selected according to the character of the exhibit. With regard to arrangement, the larger museums follow a systematic principle throughout, so that the anatomical and embryological exhibits and models are found near the systematic material connected therewith. There are of course exceptions; the skeletons of mammals for instance are often enough placed by themselves on account of their number. In the collections of the zoological institutes at the Universities and other educational establishments, the same arrangement predominates. In some cases, as at Heidelberg or Tübingen, the anatomical exhibits are arranged by themselves organically. The Hamburg museum has made an important advance in the systematic preservation of animals in spirits, by painting the objects with water colours, this giving a very natural appearance to fishes, crabs and other creatures.*)

Almost all the more important museums of Germany take considerable pains to-day in presenting "biological groups" or "pictures of life," in which several animals and plants are shown in their natural surroundings. The museums recently opened at Bremen, Altona and Darmstadt are characterised first and foremost by their large number of excellently represented biological groups. The animal kingdoms of the Alps, of the Arctic regions, the desert, or of the native woods, oceans and coasts, form material for groups which are frequently as charming as they are animate. The difficulty of describing single objects can be overcome either by attaching small numbers to them so as not to interfere with the appearance of the group, or still better by coloured photographs with numbers and corresponding descriptions. Many old museums have followed the example thus set, and have endeavoured to bring new life into their galleries by similar pictures from nature. At Darmstadt the experiment has been made to put groups together from an animal-geographical point of view; the animal life of Australia and new Zealand, as well as that of South America, have been combined into one large life-like group, and although they are somewhat unnatural, the

*) See M. von Brunn's "Ein Beitrag zur Museumstechnik," issued by the Nat. Ver., Hamburg, XIII, 1895.

different species living in primeval forests, steppes and highlands being all too close together, they still produce a highly instructive and fascinating effect. A certain amount of unnaturalness can never be avoided in a museum. In the Maritime Museum in Berlin the biological principle has been very fully extended to the animal and vegetable kingdoms of the sea. A large, dry coral reef about 20 sq.-ms area, and 22 large "Alcoholariae" present a plastic idea of the plenteousness and beauty of colour of the inhabitants of the sea.*)

The above aphoristic explanations will suffice to show that the biological museums of Germany are energetically advancing, constantly endeavouring to stimulate their visitors to a natural scientific mode of thought, and to awaken in them an enjoyment of nature. In the same degree in which increasing industry is sapping public health, the biological and hygienic sense of appreciation of our lower classes must be developed. Our natural-science museums are called upon to act as a wholesome counterweight to the evils which the concentration of enormous masses of people in large towns and the constantly increasing number of factories bring in their train.

L. Plate.

b. Botanical Gardens and Museums.

Owing to the new lines of investigation in the science of botany, and in accordance with the ever increasing efforts to make the results of scientific research accessible to still wider circles, the scope of botanical gardens and institutes has so widened that they are no longer able to carry out their aims in all the Universities and High Schools in the same manner, and in several of the latter have been obliged to confine their activity within certain limits. Seeing that besides systematic botany, anatomy and physiology, both the geography and pathology of plants are constantly advancing to the fore in botanical studies, the requirements of botanical institutes are in no small degree increased. Formerly botanical gardens were places containing collections for the botanical study of plants necessary for the scientific experiments of professors and students, biological studies of indigenous plants were made by preference by means of regular botanical excursions, while with regard to exotics one was contented with one or two specimens in conservatories, with drawings, preparations, and a collection of their fruits.

For all botanical institutes, with small means, and in which besides the professor not even a systematically educated custodian is employed, such a limitation is indeed expedient. At the present day it may be regarded as indispensable that in every botanical garden the medicinal, poisonous and useful plants should be placed in a particular department, or distinguished by special labels; and nowadays a professor would rarely like to do without a biological department in which the development of vegetable organisms in

*) See L. Plate, "Beiträge zur Technik des Sammelns, der Konservierung und der Aufstellung biologischer Gruppen mariner Tiere." In Verh. "Deutsch. Zoolog. Ges." 1903, p. 143–158.

relation to the varied conditions of plant life is prominently set forth. A botanical museum will also soon be a necessity as a means of instruction in every University. In greater cities however, the fact must be taken into consideration that teachers and scholars of various academies, indeed often business men and others desirous of knowledge, visit botanical gardens and museums to obtain instruction, and it is not only individuals who thus seek knowledge, but often whole societies conducted by a professor or learned botanist, whilst latterly Workmen's Unions are taken to hear lectures in botanical gardens. Experience has taught that, in spite of the unavoidable misapprehensions of many, just this class of people derive profitable inspiration and satisfaction from their visits. In this way botanical gardens and museums are acquiring a greater significance in furthering the education of the people, and the universal and increasing demands for this means of instruction must be considered when laying out such gardens in large towns, whilst making provision that their earnest aim as a means of education should not be thwarted by their being used as a public promenade for loafers and children. Botanical gardens have the same aim as museums, and similar rules should be made for admission: they are not intended to replace public parks and pleasure grounds, which enlightened Town Councils, influenced by professors and persons versed in botany, are now trying to make instructive.

The Royal Botanical Garden in Berlin and the Botanical Museum connected with it have in accordance with the increasing requirements undergone many changes, which have, however, for the present attained their completion in the new garden and museum at Dahlem. These institutions not only promote botanical science in systematic and biological directions, including botanical geography and phyto-palæontology, but also in pharmaceutical, technical and commercial botany, and for the last ten years colonial botany, the rearing of useful tropical plants and the study of those injurious to them. Since the year 1801, in which the celebrated botanist Willdenow became Director of the Botanical Garden in Berlin, its treasures increased immensely, so that in the year 1812 the number of cultivated species had risen to 7,700. Under the direction of Link (1815–1851), A. Braun (1851–1877), Eichler (1878–1887), and the present director Engler (appointed in 1889) this number has steadily grown, and an enlargement of the old garden (in 1857) as well as the erection of several new conservatories in the same became necessary, of which we need only mention the new palm-house erected under Braun 1857–1858, and the hot water conservatory or Victoria house built under Eichler, as they are still in use, and on account of the over-stocking of hothouse plants in the new garden will probably remain in use for a year or two.

Under A. W. Eichler's direction several innovations were introduced, aiming at greater facilities for the instruction of the masses. A department was reserved for pharmaceutical and useful plants, and a small Alpine garden and a section for aquatic plants were made; further, the hot-house plants

were planted out during the summer in geographical groups. The Botanical Museum arranged under his direction was found to be too small ten years after it was opened.

More important changes aiming at the improvement of botanical instruction in the University were introduced by Engler first in the old Botanical Garden, and on the laying-out of the new one were transferred to this and extended. Besides the already existing department for cultivating useful plants of the temperate zone, another was formed for tropical and sub-tropical useful plants. The Systematic Department was so altered that not only, as is usually the case, were the shrubs systematically grouped, but a prominent place was given to the most important types of a whole family, as far as the conditions of the open country would allow in summer, while annuals and bi-ennials were placed beside the shrubs in pots. Such an arrangement possesses the great advantage of affording the teacher the opportunity of presenting his pupils with a general view of the most striking forms in any one group of plants.

Then a Morphological-biological Department has been fitted up, intended to show how plants exist under different conditions, and how they modify their organs to suit their surroundings.

A second similar division exhibits the variation of plants in growth, leaf colouring and development of blossom, and a third shows the very varied sexual relations of plants.

The Geographical Grounds, covering an area of about 100 as, which presents to the visitor the plant world of the temperate zone, has undergone an important reform; viz., in contrast to the arrangement of all the former botanic-geographical groups, a great value was attached to the imitation of natural formations.

Corresponding groups were also arranged in the botanical museum, but above all a laboratory was fitted up there for practical and independently working students (Doktoranden). This led to the treasures of the Botanical Garden and Museum being much more used for study, particularly for anatomical work. But another problem was set the Botanical Gardens and Museum when Germany came into the possession of foreign colonies. Then our Botanical Institutes saw the task set before them, not only of coping with the ever increasing introduction of new objects of interest, but of taking their part in furthering the culture of useful plants, in the utilisation of the products of countries under German protection, and the examination of them as to their practical use. Thus as early as in the year 1889, useful tropical plants were sent to the Cameroons, and in 1891 a Central Botanical Station for the Colonies was connected with the Garden and Museum, which undertook the propagation of useful plants in order to introduce them into our colonial territory, as well as the training of gardeners and managers of plantations. After some of the officials and also the Director had been in the tropics, one was better able to judge of the conditions prevailing there, and especially to pay attention to the noxious plants among the culti-

vated ones, as the cryptogamic division of the Botanical Museum is very rich in fungi which occur in the tropics as noxious plants.

The rise of completely new suburbs in the neighbourhood of the old Botanical Garden, the injuring of many plants, particularly conifers, by smoke, the faulty construction of the older conservatories, and the impossibility of enlarging the garden on its old site, induced the Government after some hesitation to decide on its removal. Thanks to the energetic efforts of the Ministerial director Dr. Althoff, an especially appropriate site of 42 hs has been granted in the Royal Domain of Dahlem. In this area, as the exhibited plans show, it is now possible to meet all botanical requirements; this land also has the great advantage that it is treeless, so that each department can be arranged according to its particular aim. A sufficiently large space is also provided for the Botanical Museum, as well as for its future enlargement. The Museum Building consists of three parts: one for instruction, with laboratory and experimental rooms, one containing the now largely extended Library and Herbarium, and a third part accessible to the public as an Exhibition. The material which serves for scientific investigation is in a separate part. There are work-rooms besides for the officials and other botanists. The exhibition or open department of the museum is divided into systematical, pathological, pharmacognostical, technical, economic, colonial, geographical and phytopalaeontological sections.

The Morphological-biological Section (1 ha) adjoins the Museum. The two divisions for medicinal and poisonous plants (20 a in extent) as well as for economical plants of the Temperate Zone (44 a) are close by. That for systematic botany (4 hs) again, lies at a little distance from the Museum. In the north west of the Gardens the large group of Exhibition Conservatories is to be found as well as the Palm-House, and adjoining these the propagating houses, these latter not open to the public, including a morphological-biological as well as a Colonial Section (6 a) and farm buildings. In the centre of the Gardens an area of 11 hs is laid out geographically, thus giving a concise view of the vegetation of the North Temperate Zone, bringing into prominence the most important formations of the various countries and mountainous regions. In these grounds some of the groups are turned in summer into sub-tropical floral beds by the arrangement of plants in pots. It cannot be denied that this department of the Botanical Garden costs much trouble and money; but the plantations, especially those of the high mountainous regions, flourish excellently, in such a manner as has astonished many an inhabitant of the Alps. These grounds greatly facilitate the instruction in plant geography, because the lecturer can easily supplement his verbal instruction by pointing out certain traits in the individual floral domains, whilst the geographical collection in the Museum serves to complete the illustration.

In the large conservatories, pictures of vegetation in the tropics are hung, while in another division the useful tropical plants minutely labelled, may be studied. Thus opportunity is afforded to thousands of people of

comparing the plant-world of this and foreign countries, and so extending their knowledge. It must be admitted that the vegetation in distant lands far surpasses these representations, yet this kind of picturesque grouping interests not only the ordinary sightseer but also the botanist to a higher degree than the systematic divisions. Finally the large Arboretum, 15 hs in extent, must be mentioned, as it contains the trees which thrive here, systematically arranged.

It is important to mention that in the neighbourhood of the new Botanical Garden there are institutions whose aims are akin to botany, such as the Royal Horticultural Academy, to whose students the lectures and demonstrations in the Botanical Gardens are open, the Imperial Biological Institute in which the diseases of indigenous plants are investigated and agricultural experiments made, the Pharmaceutical-chemical Institute which goes hand in hand with the Pharmaceutical-botanical Department in the Botanical Museum, the Colonial-chemical section of which co-operates with the central botanical station in the Botanical Garden and Museum.

In this way the great number of plants which arrive at this centre of the Empire from our colonies and other lands, are made accessible to wide circles, and form a source of intellectual stimulus and in many cases of practical activity. Through the circumstance however of the departments which serve practical purposes being joined to the purely scientific ones, the former are prevented on the one hand from committing grave errors, whilst on the other hand incitement is given to learned botanists to consider the necessities of practical and universal instruction while prosecuting their purely scientific studies. The Botanical Garden and Museum serve also to encourage botanical efforts not only in the kingdom of Prussia, but in the whole German Empire, the Colonies and other lands, by lending collections of dried plants and sending seeds. Thus the Garden and Museum, and the same may be said of all similar establishments in German States, are not only parts of a University, but are National Institutions.

There are museums, in which rich collections brought together by generous learned men and intrepid explorers lie unused or are not turned to the advantage they ought to be. In Berlin even, it was impossible for a long time through the lack of sufficient scientific assistance to work up the botanical material which had been brought thither during the last century by numerous explorers. This state of things has been improved there as elsewhere by the appointment of a larger number of scientific officials, and now the scientific arrangement of large dried plant collections is making satisfactory progress. The necessity for Germans working in our Colonies to become acquainted with the plants around them, and especially to discover useful plants, leads botanists at home to thoroughly investigate exotic plants; yet care must be taken that in the satisfying of present wants science does not suffer.

Many systematic essays and treatises on plant geography have been published by the officials of the Museum and recognised even outside Germany

as valuable additions to science. The connection which exists with the Royal Prussian Academy of Arts through the publication of the comprehensive work "Das Pflanzenreich" (The Vegetable kingdom), or "Regni vegetabilis conspectus," is especially conducive to the interests of science.

It is self-evident that only a very small part of the comprehensive tasks of both Institutions which are here hinted at can be presented at the Exposition.

First of all a survey is given of the most important scientific work carried on during the last ten years, so as to show what a substantial share the Berlin Garden and Museum has had in the progress of botanical investigation. These studies are partly large general systematic works and partly special monographs and elaborations of plant geography from various regions. Further it is by shown by some sketches and photographs how the newly founded Botanical Garden at Dahlem seeks to fulfil its tasks, especially regarding the representation of biological conditions as well as the domain of plant geography. Finally, by a selection of important and remarkable vegetable objects from the colonies, a picture is given of their progress in botanical research, in which less stress is laid on the exhibition of large quantities of the more common vegetable products, but more on the scientific character of the collection.

Dr. Engler.

E. Medicine.

The study of Medicine in Germany, whether in its scientific and practical aspect or in its progress, is partly public partly private. In the German Educational Exhibit at St. Louis, the government organisation is particularly brought into view, and will therefore be specially dealt with here: the private institutes, however, which take a very noticeable place in Germany, are briefly referred to, especially as their work is also a result of the scientific medical education at our universities, and is not entirely unrepresented at the Exhibition.

To the private establishments belong the medical societies, the hospitals supported by private contributions, institutions founded for the study of medicine, and the various medical journals and archives, &c. Some of these publications are published and paid for by the State.

The activity of the medical (Doctors') societies is great, for it can be said that such a society exists in every town of 30,000 inhabitants, holding regular sittings at which mostly original papers are read. Many of these societies have a large number of members, the Berlin Medical Society having alone 1,000; Rudolf Virchow was chairman of the latter for many years before his death, and his successor is Ernst von Bergmann. We may mention here also the Berlin Society for Internal Medicine, with von Leyden and Kraus as Presidents, and also the German Surgical Society, the great medical Societies of Munich, Dresden, Hamburg, Leipsic and Stuttgart. Though perhaps private activity is not so prominent here as in America

yet throughout Germany there are imposing and well fitted up hospitals supported wholly or partially by private means, to say nothing of those large hospitals whose cost is defrayed by the community. To this class belong the hospitals of the Roman Catholic religious orders, particularly those of the Brothers of Mercy, those of the various Roman Catholic sisterhoods, the excellent St. Hedwigs Hospital in Berlin, and the no less excellent Evangelical Deaconess Hospitals, of which the "Bethany" Hospital in Berlin is a good example.

Numerous small and large private endowments make it possible for the poorer class of medical students to carry on their studies, for the more talented to complete them by providing books and apparatus and paying travelling expenses, and also enable pupil teachers and assistants to study scientific or practical medical problems. Particular mention should be made here of the legacy of the Countess Louisa Bose, who bequeathed to the three Universities of Marburg, Jena and Berlin a sum amounting to more than two million marks for such purposes.

Without disparaging the periodical literature of other countries we may well say that the scientific medical journals of Germany take a first place: we need only refer to the "Archives of Anatomy and Physiology" which can look back on a hundred years of existence, and also to Virchow's Archives for pathological Anatomy.

The State arrangements for the study of medicine are: 1. Medical Faculties at the Universities; 2. Special Institutions serving for the cultivation of Public Medicine and Hygiene; 3. Institutes for continuing medical education, particularly that of the ordinary practitioner, after leaving the University.

Let us first turn our attention to the Institutes mentioned under headings 2 and 3: to these belong among other institutions the two large ones in Berlin, the Imperial Board of Health and the great Prussian Institute for Infections Diseases, with which the Prussian Institute for Experimental Therapy in Frankfort-on-the-Main is connected. In addition to these there are the State Vaccination Stations. Other public hygienic establishments are joined to the Universities, such as the large one at Marburg for hygiene and experimental therapy under the direction of Prof. von Behring. Others again, in which state provision is supplemented by private contributions, exist in the form of sanatoriums for tuberculosis.

The establishments comprised under head 3 are of the most modern date. In Berlin, the Empress Frederic House for the improvement of medical education by the aid of state and private means, is an institution which is destined to serve as a center and foundation of the whole higher education of Germany. The organisation of such higher education is the task of the Central Committee for Postgraduate Instruction which has already founded local associations in twenty-five of the large towns of Germany for providing gratuituous continuous courses of instruction and lectures for medical practitioners. The state collections of educational medical

appliances which will find a place in the Empress Frederic House, as well as in the academies for practical medicine,—of which up till now two are contemplated at Cologne and Düsseldorf,—will serve the same end. In this the municipal authorities and the state combine together to make it possible, on the one hand, for doctors who have been practising for years to embrace an opportunity of improving and renewing their medical knowledge, and on the other, to receive young medical men who have just passed their public examination, and are obliged to practice in the hospital for a year.

All the German Universities with the exception of Münster in Westphalia are provided with chairs of medicine which have an organized connection with other faculties in possessing certain mutual fundamental arrangements, so that the professors of all the faculties participate alike in the administration of the University, that the ordinary professors are authorized to hold lectures in any faculty, and that similarly the students of one faculty may without hindrance hear lectures in any other. It is a pleasing fact that students make extensive use of this, and in this lies the great advantage of a University as organized in Germany. Indeed medical students are obliged to hear some of their lectures, such as those on physics, chemistry, botany and zoology from the professors of these branches in the philosophical faculty, as the medical faculties have no special chairs devoted to these branches.

The faculties are now working substantially in three directions:

1. The education of future doctors by instruction in theoretical and practical medicine.

2. In that of research for the furtherance of medicine as a science, by forming its principal centres of study.

3. By the promotion of the practical side of medicine in the institutions and hospitals subordinate to the University the infirmaries and dispensaries for out-patients of all kinds. These last accomodate a large number of patients, and in the smaller towns are the only hospitals for the Universities, in this way serving public interests.

In addition to this it is found that the young military doctors of Germany for the most part receive their medical training at the Berlin University. They are admitted into a special institution in Berlin, the present Emperor William Academy, where, besides receiving special facilities for instruction such as short courses of lectures, collections of preparations and instruments and a handsome and excellently managed library are at their disposition. It was impossible to represent all these arrangements for the public and private cultivation of medicine in the Exhibition, as unbounded means, time, and space would have been necessary; so in the main the exhibit has been confined to the medical faculties and such other state institutions as the Imperial Board of Health and the Institute for Infectious Diseases. Neither could every feature in the work of these establishments be taken into account, and therefore regard has been paid chiefly to the problem of instruction which forms one of the principal aims and ends of state medical institutions.

The German medical exhibit at St. Louis is intended to demonstrate the important objects of instruction in the several departments of medical science which have either come into use in Germany since the Exhibition at Chicago or were not represented there. At the same time the exhibit is intended to symbolize, as far as possible, the manner in which instruction is given in the separate divisions, and must accordingly comprise not only the methods of Instruction but also the educational appliances used.

The various objects are distributed in the exhibition in the following manner: round a space fitted up as a lecture hall for lectures and demonstrations particularly for projections by the sciopticon, five divisions have been grouped which are specially intended to illustrate the methods of instruction. The largest division is taken up by bacteriology; immediately adjoining is that of anatomy, then surgery in two sub-divisions, followed by that for pathological anatomy, and finally by that for medicine proper. In an ante-room leading from the lecture hall to the corridor and opposite it educational appliances are placed, Roentgen ray apparatuses being specially prominent, whilst the remaining exhibits, which have not been placed in the other divisions, have been arranged in a small narrow space separated by a passage from the Roentgen cabinet and the lecture hall.

Germany attaches the greatest importance to this exhibit of the methods of instruction, because it has been her constant endeavour to cultivate the same with every means at her disposal. It cannot, however, be expected that the objects and preparations exhibited to elucidate her aim (methodics) should be showy. They rather illustrate by a few examples the course of instruction in an appropriate and simple manner.

Thus in the Bacteriological Cabinet, the objects for which have been chiefly selected by Prof. A. Wassermann of Berlin in co-operation with the Imperial Board of Health, the methods are symbolised which are used in the identification of the various bacteria, modes of cultivation, dyeing, &c. Further a series of drawings, illustrations, preparations for projections which are made use of in research, are exhibited. The changes also which bacteria produce in human or animal organism are shown as far as they serve for methodical research and educational demonstration.

Endeavours have been made in the anatomical section to exhibit a series of preparations showing how practical instruction is imparted to-day in the Berlin anatomical lecture halls. In connection with this the anatomical cabinet contains quite a series of educational appliances used at the lectures.

In the surgery section two subdivisions have been made, one under the direction of Prof. von Bergmann of Berlin, the other fitted up by Prof. von Mikulicz-Radecki of Breslau. The method of instruction is demonstrated in these divisions by a series of models representing the single stages of an operation.

In the cabinet for pathological anatomy, arranged by Prof. Orth in Berlin, great attention has paid to methods of preservation of preparations in which the natural colours are retained; among these methods those of Melnikow, Jores, Kaiserling, and Pick are prominent.

The section for Internal Medicine has been prepared by Professors von Leyden and Kraus of Berlin, and comprises those means of investigation and appliances which concern the ætiology, the diagnosis and the therapeutics of different conditions of illnesses, and which are used practically.

The Roentgen Cabinet contains apparatuses exhibited by Messrs. Siemens & Halske, besides various Roentgen photographs by various investigators.

As often as opportunities occur, lectures and demonstrations will be given in the Lecture Hall.

Dr. Waldeyer.

3. Upper and Lower Schools.

When German methods of education and training were demonstrated for the first time in America at the World's Columbian Exhibition at Chicago in 1893, there was more space at the disposal of the German School and its teaching apparatus than this time at St. Louis. But many things can now be dispensed with which were amply brought before the notice of the visitors to the American World's Fair of ten years ago; and matters concerning German schools and education which have been reformed, or which have come into existence during the last decade, can now be specially dealt with.

However much German teaching methods may be appreciated in other countries, this circumstance does not prevent erroneous ideas of the characteristics of some of our schools from prevailing abroad, even in educational circles. It has therefore seemed desirable, in spite of the limited space at disposal, to illustrate the various upper, middle and lower schools by typical examples.

The old Gymnasium, with its traditions extending over centuries, was until a few decades ago the only preparatory school for the universities. It is characterised now as then, by its extreme adherence to the study of the dead languages; the following schools are arranged according to that plan, whether their course begins in Sexta (sixth class) or in a higher class: the South German Lycées, the Grammar schools (Halle and Magdeburg), the Royal National schools (Meissen, Grimma, Pforta), the monastic schools (Ilfeld, Rossleben), the Wurtemberg lower evangelical-theologico-philosophical seminaries, and the military academies for young noblemen (Brandenburg, Bedburg, Liegnitz). In many of these older establishments, the pupils, at least a number of them, have also board and lodging (collegers, boarders, foundationers).

In order to permit the foreign educationist to form an impartial opinion, not only have the external and internal arrangements of a large and favourably situated establishment of this sort been represented, but also those of a more modest one with a smaller attendance, (Royal Augusta Victoria Gymnasium in

Posen, and the Royal Gymnasium in Wongrowitz). The Joachimsthal Gymnasium, founded by Joachim Frederic, Elector of Brandenburg, has been selected to illustrate an endowed school, whilst Schulpforta, founded by Duke Moritz of Saxony, also an endowment, is an example of the old Royal and National schools.

Under the name of Pro-gymnasiums, frequently called Latin schools in South Germany, we understand schools without upper classes chiefly devoted to the study of Latin and Greek.

Since German educational methods were last exhibited in America, reform schools have made great strides in Germany. In the United States this term conveys a totally different meaning. In Germany it represents schools of a classic or a modern tendency which first instruct all their pupils alike through several classes, and then, on this common foundation, continue the instruction either in the classical method of the gymnasium or in giving greater attention to the modern languages, mathematics and the natural sciences.

Since Director Schlee of Altona created this common basis for the Realgymnasium (a high-school of nine classes, with Latin, French and English, but no Greek) and the Realschule (a high-school of six classes, without the three upper ones, and which cultivates modern languages only) and there has been a great deal written for and against this principle. Extended practical trials of it were not made until 1890; in 1898 this reform plan was in working at 30 German high-schools, whereby two systems were distinguished, that of Altona and that of Frankfort.

In both these systems the teaching of French began in Sexta (elementary class, pupils averaging ten years old); but the first added English in the third and Latin in the fourth school-year, while the Frankfort system, chiefly advocated by Privy Councillor Reinhardt, Director of the Goethe-Gymnasium at Frankfort-on-the-Main, allows of only one foreign language (French) in the three years' course of common instruction, followed in the fourth year by thorough instruction in Latin, and not until the sixth school-year (when the pupils are about fifteen or sixteen) is English added on the modern side (Reformrealgymnasium) and Greek on the classical side (Reformgymnasium).

In our school exhibition at St. Louis, the Goethe-Gymnasium, the Model School at Frankfort-on-the-Main, and the Reformrealgymnasium at Barmen represent the German reform schools, while in the catalogue and in written notices and time-tables there is abundant material to allow the foreign educationalist to form a clear idea of the important changes which have taken place in the matter of German, and more especially of Prussian high-school methods.

The older (Normal) system of the Realgymnasium is illustrated by the Elberfeld institution, while the third group of high-schools—those of nine classes, without Latin or Greek, in place of which a very thorough study of modern languages, mathematics and the natural sciences is made—is represented by the Oberrealschule of Bochum.

After a six years attendance at one of the high-schools with satisfactory results, the pupil receives a certificate entitling him to serve for one year in the

army instead of two. The Realschule with six classes which teaches French and English but no dead languages, dismisses its pupils with this certificate, and its system and work are shown in this exhibition by the Realschule of Kreuznach.

As the founder of the Berlin Realschulen (Modern schools) desired to give an opportunity to clever boys leaving the upper classes of the elementary schools (mostly at 12 years of age) to enter a high-school without difficulty and take advantage of its educational privileges, the authorities have created a number (now 13) of Realschulen, in the curriculum of which no foreign language is taught in the first two classes. This is contrary to the general government plan of study for all Realschulen outside Berlin, and is meant to facilitate the transfer of pupils from the elementary into the higher schools. In the four upper classes French is taught very thoroughly, while English has on the whole not sufficient time devoted to it. This sort of school is represented in the Exhibition by the Second Berlin Realschule.

Finally, to give an idea of the numerous private schools and their methods, the Evangelical Boys' Grammar-School at Godesberg has been selected, which is specially interesting on account of its pleasant situation on the Rhine, and from its peculiar organisation. It comprises a colony of comfortable family homes in which those boys who are far from their own homes are received as members of Christian families.

There is no opportunity for the mixed education of boys and girls in schools of this type. In Germany girls receive their education—except in the Grand Duchy of Baden—partly in the national or board-schools for girls (see exhibition of the 213th Gemeindeschule in Berlin), and partly in the higher-grade schools for girls with nine or ten classes. In these schools great attention is paid to the study of modern languages, and the instruction of the pupils is carried to a point which enables them to enter the teachers' seminaries so often connected with these establishments, they also having the opportunity of practical teaching as pupil-teachers in one of the "Practice schools" (Übungsschule) connected with the seminaries. A typical example of this class of schools is found in the Royal Augustaschule at Berlin. The seminary of this school grants a certificate qualifying for the post of teacher at the higher and intermediate grade girls' schools, and also offers the pupils the chance of taking courses in the dead languages. At the time of the Chicago World's Fair we had no "gymnasium" schools for girls at all. The first girls' gymnasium giving a certificate qualifying for studying at the University was founded in Carlsruhe in 1893; almost at the same time Helene Lange opened a Gymnasium course for girls in Berlin, and this was followed by Fräulein Dr. Windscheid's Gymnasium course at Leipsic. The exhibits of the Sophienschule at Hanover, an upper municipal school with a gymnasium course for girls, illustrate the work and tendency of the latter schools.

National-school teachers obtain their preliminary training in independent seminaries; the one selected as typical for the purpose of our exhibition is the Royal Teachers' Seminary at Burgsteinfurt in Westphalia.

The corresponding institutions for male teachers are the Schoolteachers' seminaries, represented by the one at Ziegenhals, the preparatory course for which is passed at the so-called "Präparandenanstalten" or preparing establishments. In addition to this there are also Practice Schools (Übungsschulen) of one and three classes, which provide the necessary pupils for practical experimental teaching.

We have no special Teachers' Colleges or Normal Training Schools for training candidates who have already gone through a special course at the Universities for higher teaching posts, as in the case in America. The principal part of the training is relegated to the Universities and their seminaries. In order, however, to meet the requirements of the examination for higher grade teachers, in a number of the higher educational establishments seminary courses have been introduced which are immediately connected with the teachers at such establishments, and are intended to give beginners in the teaching profession opportunity to obtain further pedagogic training. This is done by means of conferences held under the presidency of the Director, by allowing them to attend lectures by sound and capable higher grade teachers, and by their writing essays upon questions of education and method. Besides the information contained in the official regulations regarding this system and a summary of the work of the seminaries at present in existence for candidates for higher grade posts further details as to the internal work of these higher pedagogic courses may be obtained from the explanations, some of which are in the form of notices.

Between the higher and lower grade schools come the intermediate schools where only one foreign language is taught. The organization and aims of this class of schools are illustrated by the First Intermediate Girls' School and Arndt Boys' School, both at Stettin.

The more modest, though not for that reason less important purpose of the lower grade schools, the national or board-schools, is to instruct the youth in the general knowledge and accomplishments necessary for plain middle-class life. In the one-class National Schools (the simple village school of Datum-Nienhöfen in the Province of Schleswig has here been chosen as an example) boys and girls of all ages at which they must attend school are instructed in one and the same room by the same teacher. In the different conditions of town life it has been found necessary to establish numerous board-schools of several classes. The instruction given by these schools, as shown by the curriculum, summaries and exhibits submitted by the two Berlin board-schools (the 232nd for boys and the 213th for girls) embraces more than the merest elementary branches. Physics, for instance, is also taught, and each of the 260 odd board-schools in Berlin has a small well-fitted room for this purpose, the apparatus of which is shown in the exhibition in two cases.

The care which the state and the parish take of the poor children who during their early years have been able to obtain no instruction, can be seen from the exhibits of the auxiliary schools for deaf and dumb, blind, and weak-minded children at Frankfort-on-the-Main, Steglitz and Dalldorf;

these exhibits are supplemented in many directions by single municipalities as well as by the Royal Central Deaf and Dumb Institution at Munich, by Director Kunz (Illzach) and by Instructor Frenzel (Stolp). In institutions of this sort, which are often supported by liberal private endowments, the children receive instruction according to their capabilities. This not only serves to keep alive the remaining spark of intellect, which though small is often found to be still in existence even in the poor weak-minded child, but the unfortunate children themselves are also brought up by tender training to enjoy to a certain extent the happiness of other children, and to develop their capabilities and talents such as they are. In these successful institutions, which for the most part are to the children dearly loved homes, they receive an education in some trade or occupation so that they finally become independent and capable of working with their hands, and are not obliged to seek support in the form of charity.

The military training establishments, including the cadet schools, follow the same curriculum as our Real-Gymnasiums, and are this year represented in the Schools' Exhibition.

The qualification certificate for one-year volunteer service, obtained after successful attendance at an upper-grade school for six years, is also granted by certain German schools in foreign countries (Antwerp, Brussels, Bucharest and Constantinople). Some treatises, summaries and examples of school-work, as well as views are exhibited.

We cannot here give details of the sums expended in the German Empire and in the larger Federal States upon national schools and the higher education of youth, for the training of teachers, &c., nor can we fully show how much success has been met with, how great the attendance is, what is the number of teachers engaged, nor how the pupils are divided according to the standing of their parents, their creed and the selection of a profession in after life; we might also, if space permitted it, prove how the small number of entirely illiterate is gradually decreasing, what strides the whole question of education has made in Germany, particularly during the last generation, how enormously the expenses for educational purposes have grown, and quote the sums expended in pensions for teachers and providing for bereaved relatives. All these points have been clearly brought out by numerous tables, diagrams, and curves which are on view at the Exposition, and the critical expert who examines our school exhibit will recognize the instructive tendency underlying its arrangement.

But the attention of the non-specialist visitor will also be attracted for a while to the exhibits which show by models, photographs, coloured pictures or plans, the places where young Germany is brought up and fitted for its future calling in life.

It is comparatively seldom that the educational institutions of Germany benefit by large donations from benevolent citizens; it is mostly left to the care of the state and the municipalities to make the necessary outlay, to build municipal schools with light healthy rooms provided with heating and ventilating plants as required by modern hygiene. The expenses of building

noted upon the models of school-houses, gymnasiums and the like, give some idea of the proportionate internal fittings, and particular attention should be paid to the exhibits shown by the most capable municipalities of Prussia, Bavaria, Saxony, Wurtemberg, Hesse and Alsace. In this Schools' exhibition of German towns there is therefore much to be seen which could not well be included elsewhere, viz., school gardens and baths, kitchens and workshops, museums and reading rooms, barracks and holiday resorts.

A special department is devoted to gymnastics and school sports, games and hygiene. The literature represented by books and periodicals, the sketches and photographs and a large model of a gymnasium show that, as a result of the incentive given by our Emperor, the physical training of the German youth is in no respect behind that of other civilized countries.

Any person examining the photographs of German school-boys at play and on tour in the woods and mountains, in the shower-bath and swimming, rowing and exercising in the gymnasium, must realize that in the youth of Germany, though the school discipline is strict, there still lives a fresh, free, and happy spirit.

The pains we take to train the eye, to develop in the rising generation a more and more aesthetic temperament and an interest for the highest and most ideal faculty of recreation existing in man, namely, for Art—all this is the purpose of our exhibition of drawing and artistic wall-decorations. The educational appliances exhibited by the Berlin Albrecht Dürer House, and the portfolios of school drawings submitted, show in what direction the reforms in the teaching of drawing are moving in Germany, how real objects, natural or artificial, serve from the beginning as models, how colour as well as form is also considered in all grades of instruction, and how throughout the whole instruction, drawing and sketching from memory is encouraged.

In addition to the artistic pictures and sculptures which are intended to train the taste of the pupils by their presence in the class room, our school exhibition is still further embellished by a number of busts. They represent in the course of instruction in the classics, heroes, thinkers and poets of the classical age. There are, however, also a certain number of German educationasts represented who have rendered great services in the education of our youth and in the development of our school system.

We would gladly have arranged around Froebel's portrait an extensive collection of Froebel literature and an exhibition of the German Kindergarten work, but the space at disposal would not permit of it. It is just in this particular branch that American educationasts have now for a number of years been studying with great thoroughness the striking features of German education.

The German exhibition contains a small but picked selection from among the copious amount of educational appliances at present on the market in the form of atlases, reliefs, globes, models and other apparatuses such as diagrams and text books, and has been confined to the most characteristic and novel specimens. The selection includes a few models of school furniture of modern construction as well as ingenious contrivances for assisting elementary instruction, and finally lesson books for all branches of the

lower, intermediate and upper grades of our school system. It also comprises educational treatises and books of reference in which the educationast can obtain all the information he requires upon German education, the history of German schools, their constitution, methods of instruction, didactics, school statistics, and the most recent reform movements.

He will also be able to obtain information about the qualification certificates given by the various kinds of schools, and he will gain the impression that the way to the highest ideal of education is open to every one in Germany to-day, and that attendance at the University is no longer an exclusive privilege conferred by the humanistic gymnasiums. During the last generation new standards have been adopted and new forces have been called into the field to advance modern education. Great has been the service rendered by our Emperor in drawing attention to the necessity of schools making allowance for the altered requirements of the present age, and of adopting new systems in order to give the youth of Germany the proper equipment for the present struggle for existence. The picture which we offer the visitor to St. Louis is therefore very different to-day in many important features from that which we presented ten years ago at the Columbian Exposition. The discussions and decisions of the conference held by Emperor William II. in December 1890 have in the meantime born ripe fruit, and an Imperial Note dated November 26th, 1900, marked out the ground for the further advance of school reform on the lines of sound progress and in conformity with the spirit of the age.

It is quite impossible at an Exposition to represent in a convincing or sufficient manner the fruits and tangible results of such a work of reform. School exercise books and final examination work (there are but few examples of these) have been purposely selected so that good work is also accompanied by bad. And if these exhibits are not exactly interesting, and are open to criticism, these ordinary objects of school work display at any rate the actual results of instruction and learning; they also give the foreign educationalist the only opportunity of examining the work which has really been done and what has been accomplished; and this he can never secure from the most effective photographs of classes and written explanations of the systems followed. Insufficient and incomplete the picture certainly is, for unfortunately it is impossible to bring to a Universal Exposition a German instructor of youth surrounded by his class of attentive boys and eagerly listening girls. And there is something else which obviously cannot be made clear in books or by pictures nor represented at an Universal exhibition, but which has been busily at work for hundreds of years in the German school house; it is the idealism of German teachers of both sexes, the energy with which they work, the training and discipline of the youth of Germany, its keen attentiveness, and honest diligence.

Dr. Bahlsen.

GERMAN ART.

German Art lived and throve during the nineteenth century under different conditions from those which prevailed in the French or English art of the same period. France and England have enjoyed for centuries the possession of centres of national life which have attracted the majority of the productive forces of both countries. Artists and men of letters who entered the capital found in it their intellectual home, and felt themselves imbued with the concentrated vital energy of the whole nation. Their creations represented not only their most ideal aims, but were further enhanced by the collective spiritual force of their country.

In Germany no such centre of national artistic life was formed. There was not a single town in which all artistic effort was concentrated in order to develop to the highest standard by constant intercourse and emulation. At least a dozen towns, large and small, attempted, independently of each other, the culture of high art, each of which endeavoured to find complete expression for the artistic power of the nation.

The natural result of this division of patronage was the attainment of greater variety, while decreasing the actual quantity of production. The art-cities of Germany, owing to the variety of their characteristic features, differed materially at the beginning of the nineteenth century. These old birth-places of mediæval art play no part in its artistic movement.

Between the bourgeois culture of the times of the reformers and that of the nineteenth century, we find a period in which the numerous princes of Germany collected around them the vital forces of their territories When in the nineteenth century the political reconstitution of the country created a new opening for the development of civil life, it was confronted everywhere by the surviving admiration of the times of absolute rule which it had adapted to its own purposes. If we wish to understand the material and intellectual condition of German art in the nineteenth century, we must not forget this particular historical development.

In the seventeenth and eighteenth centuries, the prince, as head of his dominions, comprised within his own person the whole governing power, and was consequently the patron of art also. But very little of the art of former times was left after the Thirty Years war; artists who during the heyday of mediæval culture had shaken themselves free from the ordinary professions, had, during its decline, fallen back on the formation of guilds, from whose restrictions there was no chance of escape without exciting the jealousy and conservatism of the rest of its members.

Under such conditions the German art of the time could at most meet the requirements of the prince and ruler, and his taste lay for the most part rather in architecture and sculpture than in painting. This led to the engagement of foreign artists for the special purposes of those princes who were bent on adorning their palace and churches, and was the origin of the numerous schools which sprung up everywhere in Germany during the seventeenth and eighteenth centuries, organised strictly on the pattern of foreign institutions of the kind.

What was taught in these schools was not the remains of the old bourgeois culture, but came from abroad. Court influence turned the eyes of German art towards Italy and the Netherlands, and, in the eighteenth century, towards France. Thus the essence of German art became a re-development of French, Italian and Dutch thought, and the originators of this development were as often foreigners as Germans. The result was that in painting the national inventive power was suppressed, while in architecture and sculpture it developed to a high degree. The buildings of Frederic the Great's time, the architecture of Dresden, the palaces of the clerical principalities of western and southern Germany, Schlüter's works, and the smaller porcelain plastics are all proofs of this independent development of foreign thought.

It need hardly be pointed out that the prince-patrons opened their schools in their own capitals, and not in those old bourgeois centres which had been the seats of national life during the previous era. These capitals, which at this time of the reformation were still small and unimportant country towns, vastly inferior to the great civic centres, became endowed with new life through the prince and his court; the plan of their streets, the very façades of their houses were designed less for the convenience of the inhabitants than for the decoration of the "capital and Residence." To understand the development of German art in the nineteenth century, these facts must be remembered.

After the wars of the Napoleonic era, the middle classes came into greater importance, and a national feeling was born. The old bourgeois centres awoke from their long sleep, and in the second half of the century their financial power again surpassed that of the majority of the Residences, with the exception only of Berlin. Side by side with such commercial centres as Nuremberg, Augsburg, Frankfort, Cologne, Leipsic, Hamburg and Bremen, new industrial centres in Saxony and Westphalia put their claims forward.

Large private fortunes, and a high average of prosperity amongst the middle classes were found in places where the old productive power had fallen asleep, and a new one had not yet been developed.

In the meantimes the new state had everywhere taken the place of the absolutism of the older Residences, preserving their traditions, and completing what they had begun.

The academies became state-institutions, and their number was increased by the addition of several new ones created on the same pattern. The majority of these institutions remained where the will of their founders had established them, only exceptionally where they were most required, but seldom in the old capitals of national life.

This is the reason why Germany became possessed of art centres where art was taught and followed in a manner similar to that of the smaller German universities, in no relation to the movement of the times.

Many pecularities of German art of the nineteenth century may be explained by this particular fact, above all two:—the little resistance of German art to foreign influence, and the loose connection between art and the most important part of the people,—the middle and lower classes.

If Germany had had one great economic intellectual centre of art, its power of resistance to French thought would have been greater. In considering the question of foreign influence on the Germany of the nineteenth century, we speak particularly of French thought, for it comes first, that of England making itself felt not only considerably later, but more indirectly. The fact that modern German art is insufficiently connected with the life of the nation, is shown by the circumstance that portrait painting is its weakest point: how many great German portrait painters can stand by the side of Lenbach of Munich, Kalckreuth of Stuttgart, or Liebermann of Berlin?

The difficulties described above were early felt, and already in the twenties, certain amateurs in art were trying to mend matters. At that time there existed no dealers in art who took serious notice of contemporary productions, and the art exhibitions of the period were not worth mentioning; nevertheless the schools which in the previous century had trained artists for the service of the princes, continued to send into the world crowds of artists whom the middles classes of the day were unable to appreciate, whilst the few remaining princes were practically no longer the art-patrons of former times. As a remedy societies were formed which utilised the aggregate small contributions of their members to cultivate a lower class of art, sympathetic and comprehensible to the somewhat crude taste of the majority of their members.

These societies had the merit of cultivating and developing the exhibition-system which was finally taken up by the state, and which, steadily growing, began at length to introduce the art products of foreign countries. Germany became a large international market, which by the quantity and

variety of its wares endangered the development of refined taste, and even of artistic home-production.

Schools of art, out of touch with the life of the people and far removed from the economic centres of the country, art societies as patrons of an indifferent or even low class of art, exhibitions of ever growing dimensions, and in connection with them a highly developed art trade, ill-arranged connection between the artist and the public—such were the conditions under which German art developed during the second half of the nineteenth century.

Of the art schools of Germany, the first places must be accorded to Berlin and Munich,—Berlin, the capital first of North Germany and later of the whole Empire, and Munich the capital of the south. Next to these come Dresden, Carlsruhe, Stuttgart, Weimar and Düsseldorf,—the last a very hot-house growth which received its academy in exchange for its famous gallery when the latter was transferred to Munich; but under the management of such masters as Achenbach, Knaus, von Gebhardt and Janssen, Düsseldorf has been able to hold its own amongst art-schools, and even to gain high repute. Frankfort-on-the-Main and Hamburg alone of all other towns had been able to develop a characteristic art without the aid of an academy.

Munich and Berlin are as different to each other as are the north and south of Germany, as Prussia and Bavaria. Munich has been for decades the art-capital of Germany. The community of artists there forms almost a state within a state. From Munich impulses have gone out which carried all Germany with them, and there art has found close contact with the life of the people. For Munich has still all the characteristic features of the capital of an agricultural country. An important, in some opinions the most important part of the art of Munich, the highly developed art of caricature, has been born out of the intimacy of academic art with the genius loci of the city. Nowhere in Germany was this style of art developed so early, so perfectly and so universally as in Munich, and nowhere else so attractively.

Kaulbach the great pupil of Cornelius, Schwind the masterly inventor, Spitzweg the caricaturist—from these this branch of art goes down without a break to the greatest of its living representatives, Adolf Oberländer; and if some day the life work of Fritz August von Kaulbach and Franz Stuck come to be reviewed, their caricatures cannot be omitted. In Munich appear the most important of the German comic papers, the older "Fliegende Blätter," the more modern "Jugend," and "Simplicissimus." The wit even of Berlin, in spite of many attempts, has been unable to produce anything similiar. The reason of this singular fact is, that the Munich artist lives among a people of jocular propensities and full of fun, a people which created the characteristic class of poetry known as "Schnadahüpfl." We must remember the peculariti[illegible] of the Bavarian race if we wish to do justice to the Munich "genre painting" with Defregger as its principal representative; and even Leibl, the greatest of the Munich painters of modern times, is a true Bavarian.

The peculiar spirit of Munich art even takes possession of artists who come from other parts of the Empire and settle in the Bavarian capital. Even in such artists as Fritz von Uhde, who to all appearances remains uninfluenced by Bavarian fun, the local influence may easily be noted.

Many favourable circumstances have been at work producing and fostering this predominance of art in Munich. Since the twenties, the kings of Bavaria have applied themselves enthusiastically to one of their regal duties, the cultivation of art: it was they who planted the seed of the present artistic life in Bavaria. The erection of the Crystal Palace in 1854 had a great influence of the development of exhibitions and the art trade generally. For decades the exhibitions at Munich were leading events in the art of all Germany, and it is only in later years that those of Berlin, Dresden and Düsseldorf have reached equal importance.

Artistic life in Berlin has grown very much more slowly. Even as late as the beginning of the eighties the art exhibitions of Berlin were of but small importance. They were arranged every two years by the academy, created very little sensation at home, and none abroad. Permanent exhibitions arranged by the art trade did not exist; the intellectual life of the city was devoted to other purposes. Of late a great alteration has taken place in these circumstances, and Berlin is becoming one of the largest centres of the art trade on the Continent. Its architecture,—which for some time past has been influenced by that of Munich—and its sculpture have become predominant throughout the North of Germany. Even at Frankfort the Berlin style is predominant, though one of the most original Berlin architects, Wallot, is a native of that city. Only one city of the north ventures to compete with Berlin in this regard, Hanover, whose red brick style has been adopted for some of the Berlin churches. Enormous commissions for plastic art have developed sculptural activity to an undreamed of extent. The protection of the present Emperor is extended chiefly to statuary. Reinhold Begas of Berlin and Schilling of Dresden may be called the leading monument sculptors.

As far as it is original, Berlin painting has often transgressed academic rules. The classic expression of this fact is found in the works of Menzel; and it is characteristic of Berlin, as compared with Munich, that this great master-spirit did not take his subjects from the life of the people, but rather from the history of the reigning dynasty. Only after reaching modern times in his coronation picture of King William did he devote himself to a description of the life of his own time. Anton von Werner is at present the exponent of official taste in the domain of painting. Taken as a whole, the present generation of Berlin painters is somewhat devoid of uniformity of character. Liebermann, though born in Berlin, is under Dutch and French influence. Ludwig von Hofmann, lately removed to Weimar, might just as well belong to Dresden or Munich; like the sculptor Adolf Hildebrand, who divides his time between Munich and Florence, and the group of rising sculptors Diez, Geyger, Volkmann, Tuaillon and Hahn, he lives in an ideal world of his own which is only connected with realism by means of the portrait.

In science and literature, especially in dramatic art, Berlin is already indisputably the capital of the Empire, and will assume no doubt in the near future a predominant position in the realm of productive art. In architecture it has already created a style of its own though the works of Wallot and Messel.

Admitting so much, we must not forget that the last decade of the century has given new impulses to art and the love of art almost everywhere.

In the old centres of the German race, and in the Residence towns alike, fresh life is at work. Much has been done in Cologne, Hamburg and Frankfort to revive the forgotten art of previous times, and to render new homage to its productions, so long underestimated. The distinct purpose of creating a new artistic life in the heart of the people has been connected with such endeavours. In cities like Dresden, where Prell and Kuehl exert their energy in developing the system of exhibitions, and in Carlsruhe and Stuttgart where Dill and Kalckreuth stand pre-eminent, the care of the government is bestowed on the artistic education of the people and the proper training of the artists. Some artists show a tendency to prefer the quiet of a country-life to the academical city. Max Klinger, to whom we owe the revival of black and white in Germany, has left Berlin and Rome to return to his native city of Leipsic, where he works in quiet seclusion. Hans Olde, till he lately took over the direction of the art school in Weimar, never left his quiet country house in Holstein. In such remote and solitary places as Worpswede and Dachau new schools of painting have suddenly been formed. Hans Thoma, lately appointed at Carlsruhe, lived at Frankfort; his peculiar style gathered from his home in the Schwarzwald, has only of late been fully acknowledged. In some respects Thoma resembles Arnold Böcklin, who, though born a Switzer, has found his artistic home in Germany, and whose influence now rules supreme over the fraternity of younger artists.

Thus the artistic development of the new century may be expected to form conflicting forces,—those which draw life towards the capital, and those which tend towards decentralisation.

There is no lack of meritorious attempts to depict the history of German art during the nineteenth century, but in spite of the most diligent utilisation of existing material, they one and all fall far short of doing adequate justice to the importance of the subject.

We do not know as yet the full extents of the artistic work of our times; a list of the names of art professors is far from throwing light on the vigour of artistic life of Germany. Everywhere, even in the centres of art culture, artists have been at work who are already more completely forgotten than if they had lived in the fifteenth century; yet the names of some of these will in future times claim equality with those of the present leaders. Wherever earnest inquiries are made, such artists are discovered. Their pecularities render them incapable of competing with their more fortunate brethren, yet history will recognise their greatness. Even in Paris, the

home of centralisation, original spirits have been known to stand apart from popular and official art; and if this is the case in Paris, how much more easily would the German incur the fate of being overlooked or forgotten. In Paris French life incessantly observes and reviews its own progress; in Germany we are so busy in studying art and life abroad that we are apt to overlook many and important things at home.

The time has not yet come for registering the names of unrecognised and forgotten artists of merit: when completed it will be found that the history of German art of the nineteenth century includes whole chapters treating of other men and other works than are now known. Yet that new history will not be poorer than that of to-day in spite of the difficulties and conflicting influences against which German art has had to contend. At the day of reckoning, German art will be able to hold up her head proudly by the side of her French and English sisters. *Alfred Lichtwark.*

ART INDUSTRY.

Art Industry has only been extensively and methodically cultivated in Germany during the last few decades, for up to the middle of the 19th century but little attention had been paid to the same, except in the nature of decorations for monumental buildings. The middle classes affected unassuming styles, which were influenced in the direction of simplicity and rectalinearity by newly arisen factories and machines.

When in the course of the seventies industrial life brought greater wealth in its train, these unassuming forms no longer satisfied luxurious tastes. The elaborate forms of past ages were imitated in the desire to further embellish the appearance of dwellings. Owing to political influence, preference was shown for renaissance forms and especially for the German renaissance of the 16th century. The latter, with its great perfection of ornamental detail, met the need awakened for fanciful shapes. In this direction Munich led the way and exercised a great influence over southern Germany, the movement afterwards spreading to the north.

In Berlin the overflowing wealth of renaissance forms was moderated by the classical education of leading architects; the erection of palaces too, at the beginning of the 18th century, exercised considerable influence in replacing the somewhat frivolous old German renaissance by Schlüter's forcible baroque style.

In the eighties many attempts in rococo and pedantic forms may be noted, which, however, were not always favourably influenced by the heavy character which Germany imparted to them during the 18th century. For ecclesiastical purposes the Gothic style maintained its position; it was not, however, considered desirable, as in the beginning of the 19th century, to retain the late Gothic style, but early Gothic and Norman patterns were imitated. The latter particularly asserted itself through its fantastic shapes, which had been somewhat influenced by classical antique and by oriental art.

Attempts to introduce middle-age forms into secular art only met with success in the restoration of old castles which is even now being prosecuted with great zeal. Such attempts, however, increased the number of historical reminiscences, which finally acted like a drag on living art, and which rendered the free growth of a style suited to our modern requirements so difficult.

In the beginning of the nineties the feeling that historical art played too great a part began to be clearly felt. This feeling was specially caused by the introduction of English furniture and utensils which showed how it was possible, whilst retaining the greatest simplicity in shape, to fulfil the real aim needed in a light and practical form. The English ornamental forms, many of which can be traced to Japan, or are borrowed straight from nature, were especially welcome, above all in flat patterns. The direct imitation of Japanese patterns has however been discontinued lately.

A short period of superficial imitation of these patterns and models, which include specimens of North American art industry since 1893, was soon followed by an extension of the direction in art characterised as "modern." Whereas previously the designing of patterns had been entirely in the hands of trained artists, painters, sculptors, and enthusiastic amateurs now came forward who often vigorously opposed historic and traditional styles. Of course in the constant endeavour to find something new at any cost, it was impossible to exclude all exaggerations, but the chief result has been that the status of industrial art has undoubtedly been raised. People began to recognise the invention of new forms of ornamentation as an object worthy of an artist, and products of the modern tendency gained access to art exhibitions. Although such products were at first considered only as curiosities, yet the taste for them on the part of the public increased more and more up to a certain limit; no inclination however exists to renounce historic styles entirely, either in churches or palaces, and even the houses of the middle classes adhere to the traditional styles of former centuries.

Such conflicting currents of progress and stagnation greatly contribute to the difficulties with which art industrial establishments have to contend.

The way, however, for the cabinetmaking, hangings, and lighting apparatus industries, &c., has been made somewhat easier, for, as is self-evident, the modern demands made by society and hygiene, necessitate the introduction of new styles.

People are agreed that superabundance of architectural ornamentation should be banished from proper sitting-rooms, bed-rooms and nurseries, and that every piece of furniture should be constructed according to its use, without regard to historical reminiscences.

This movement moreover finds unexpected support in the simple, constructive forms which unconsciously grew out of the changed technics in the first half of the 19th century. People are now inclined to value the mahogany furniture of 1830,—which was extremely despised about 1870,—higher than the sumptuous works of the renaissance, as useful models. In this direction of common sense construction the Gothic type has come more into use, especially in the work of modern artists.

In Germany also the contrast between the town residence and the country house or cottage is very marked, the latter forming a real experimental field from a constructive point of view.

The modern machine with its forms based purely on technical science, such as the sewing machine, motor, cycle, &c., has accustomed the eye to finding a line which is suited to the purpose required and is also satisfactory in an æsthetic sense. This has resulted in the development of a school which affects lines excluding all natural shapes for flat ornamentation.

It has been much more difficult for the fancy article industry, the task of which is to produce newly invented artistic forms, for it is now cut off from the old traditional sources. It is true that artists are now more prominently occupying themselves with the solution of such tasks, but on the one hand the broader branches of this industry (gold, silver, bronze, ivory, and pottery work, &c.) are in a stage of transition which renders it very difficult for them to participate in an international exhibition, while on the other hand, flat pattern branches, dependent on natural forms which are elaborated in fanciful shapes, have had less difficulty in making progress, whereby the range of colours has been quite amazingly developed.

The technics which are still to be found in outlying country districts have proved to be full of life and capable of development. The most simple hand-work, carpentry, bold fusions of colour and simple but effective glazings have become starting points for modern formations of refreshing effect.

An important feature in the modern direction is that the centres of creative art are greatly increasing, for the modern direction is opening up a wide field to individual invention. Whereas for centuries Berlin and Munich with their academical institutions were the centres of art, we now see Dresden, Hamburg, Carlsruhe, Darmstadt, Weimar, &c., coming forwards independently. Here princely patrons, or single independent groups of artists exercise decisive influence. Public education too is elevating artistic taste even in provincial towns. Nearly every fairly large town has its industrial art-school

with library, and sometimes even extensive collections arranged as a museum. In the centres of large industrial districts there are technical schools, in smaller towns at least evening classes combined with drawing and modelling classes.

The finishing of houses. Consequent on the historical direction, a preponderance of ornamental forms can be noted, and even celebrated architects when erecting fashionable villas keep to old styles, giving those of the 18th century the preference. This inclination, however, is yielding in large towns, especially in Berlin, to simplicity of form.

On the outside of houses, in place of stucco work, freestone or simple frame work or brick work is being introduced, in the interior freely cut stucco instead of moulded plaster of Paris. For doorways and wainscoting architectural forms are being gradually abandoned, and smooth or gracefully curved lines are taking their place.

The recesses so much liked in the renaissance movement are being restricted to window-places and fireplaces, as rooms ought to be spacious, well lighted, and easily adaptable to all purposes. The dark colouring of former times is entirely giving way to light shades. As ceiling decorations really new inventions in decorative art and lightly sketched tendril and flower work with figures interspersed are being introduced in place of painted representations, and everything flat is rendered in bright local colouring as an effective decoration.

Modern wall-paper is made in the same style with flower and leaf patterns; they are in themselves hardly noticeable, and serve only to give colour to the background. The wall-paper appears as paper, and does not attempt to imitate cloth or leather. Walls are now rendered far more effective by colouring than by patterns, and the chief point aimed at is to produce uniform tones in the whole space to be decorated. The walls and ceilings are no longer decorated with stucco friezes, but with painted or printed borderings, dark wood-work or leather hangings. Side by side with this modern tendency, the old styles with their many excellent effects are frequently used, more especially in villas.

Furniture, as shown above, is gradually undergoing a change which was first taken up by exceptionally active circles, but which as yet has hardly entered the precincts of old princely houses. Wherever in the latter or in the stubbornly conservative middle classes the need for simple and smooth furniture has been felt, the Empire style, more especially of English design, has been introduced. Sheraton's, Hepplewhite's and Adam's patterns dating from the end of the 18th century are much in vogue. The dread that modern art may soon perish urges the antiquary to buy without paying any regard to artistic merit. Older palaces of a definite period must of course be furnished in harmony with that period, so for instance the Royal castle in Berlin is fitted up with rococo furniture, and baroque furniture was used in those of Louis II. of Bavaria.

Fixed furniture is opposed to all modern ideas in furnishing, and especially contrary to American taste. People are banishing high heavy cupboards, large

immovable divans and heavy cumbersome tables from their rooms. Sofas and chairs, &c., are made in great diversity of form so as to suit all tastes, and are so lightly built as to be able to be grouped according to momentary inclination. The power of invention in this direction has proved so great that no fixed type has become the fashion, more especially as the requirements of a house are not so definitely settled as is the case in England. In Germany customs and habits vary in different towns, town districts, or even in the various flats of the same house. The invention of new styles is due more to the artist than to actual requirements.

Architectural forms being unpopular it is customary to use either light contours in imitation of plants or carpenter-like angular constructions. Many of the ideas for curved furniture must have been inspired by the treatment of wood in shipbuilding. Carving is losing ground in this kind of furniture, the surface being now brightened by inlaid work. The excellent cabinet work for which Berlin, Cologne, Mayence and other places have long been renowned, offers a splendid field for new inventions in the furniture line. Cheaper furniture of pinewood is often stained according to the English fashion, and sometimes painted to represent rural scenes.

For bedrooms, nurseries and summer-houses smooth washable furniture of bent wood or metal with rounded edges is increasing in popularity. It is becoming more and more the fashion to shape furniture in every detail in accordance with its practical use, and this can be said to be the main feature of modern taste.

Small articles of wood, ivory and kindred material suffered first of all from the disappearance of historical patterns. Original invention in this direction was not easy, but now individual artists are beginning to use wood and ivory for plastic art, and this will probably infuse new vigour into the industry.

Metal. The working of precious metals received great encouragement from the events of history and the need of objects for presentations consequent thereon. The large number of objects from former centuries still preserved in Germany offered a rich store of suitable patterns for the execution of presentation silver-ware. Such orders have become rare in the last decade. The ornamentation of tables with heavy centrepieces, &c., is no longer fashionable. Prizes, &c., for sport are, it is true, very numerous, but in extent and execution retrogression rather than progress is to be noticed. For those orders received, however, the silversmith and his modellers are uncertain as to what tendency they should follow, and content themselves for the most part with smooth forms, partly in the Empire, partly in the Japanese style with light flower ornamentation. Various original ornaments have been made at Munich by artists in phantastic forms and destined for no particular use. Glass and delft-ware articles are being made by silversmiths in light fancy shapes with a decided modern tone.

Jewelry has developed of its own accord; patterns enough have been found from modern plant ornamentation, which are well suited for imitation

in coloured stones and enamel, and in the most fanciful style. The fresh motives obtained, however, soon become common, by being imitated in inferior wares.

Enamel painting has assured a place for itself in technical work and has developed from the minute imitation of Limoges work to the most extensive colour effects. Enamelled iron is most prominent for decorative purposes.

The bronze industry has received a great impetus from the numerous orders in the monument line. In the last few years sculptors have begun to do independent work for small plastics, instead of remaining satisfied with imitating already existing models on a small scale. Gold bronze work has been discouraged as far as private orders are concerned by the disappearance of the taste for rococo, but much has been required for palaces of older origin; a great deal, for instance, has been ordered for the castle in Berlin. Plastic bronze is less in demand for fireplaces and lighting apparatus; for electric lighting, thin smooth brass holders are used in preference, a fashion which seems to have originated in America.

Embossed copper is best suited for the renaissance style, but is slowly pushing its way with the new forms.

Tin and alloys of similar colour have been adapted most successfully to the new tendency. Instead of the detailed reliefs of bygone ages, the mild lustre of smooth surfaces is reproduced, and a quite original style has been fashioned (Cologne, Munich, Berlin).

Wrought iron has been accorded almost undue favour in Germany in the last few decades, and has been used in almost every kind of ornamentation, both in mediæval and baroque style, even in the remotest districts. It cannot however follow the modern tendency, as constructive correctness forms the basis of all lattice work. It is much more advantageously employed in bridges for street traffic. A happy combination is made with it and malleable reddish-gold aluminium bronze.

Artificial pottery. In Germany the traditions of the 18th century of the golden age of porcelain have not disappeared. The rococo models are preserved in the Royal manufactures of Meissen and of Berlin. In Berlin, since 1880 numerous specimens of baroque style have been completed, some of which are of enormous size, of exceptional technical perfection and painted in a peculiar dull colour with flowers. It has been possible to adorn the walls of large rooms with monumental wall pictures and pilasters. Of late Meissen and Berlin have greatly increased the pallets of their hard fire colours, and have obtained phenomenal successes with their crystallising running glazes suited to modern models.

Fayence and majolica received the best support in the stove industry. Now that central heating has made such progress in the best houses, the surest and best source of employment in this direction is disappearing.

On the other hand their employment as wall decorations, wall panels, for the sides of hearths, for fountains in courtyards and antechambers, and also for insertion in house façades is increasing. Old German bowls and similar drinking vessels, are slowly disappearing, and no progress can be

recorded in the artistic decoration of such wares. The advance made in colouring glazing on country clayware is evident everywhere, and great ingenuity in ornamentation has been displayed in this branch.

Stone for flagstone flooring is as important as ever. The patterns are traditional. Stoneware vessels like old German jugs are not so much in demand. The larger breweries have begun to have special types made for their beer jugs.

Glazed stoneware is only used for cheaper wares with printed ornamentation. All the above named technics have been influenced by Japanese claywares with simple groundwork, running glazings, and faint, apparently chance decoration. Besides utensils intended for ordinary use, ornamental utensils of phantastic shapes are made in great quantities.

Glass retains for the most part, as far as cut table glass is concerned, its traditional forms. Blown glass on the other hand has again become very popular in the form of long slender goblet shapes, as well for ornamental as for useful glass-ware. Flashed and cut glass, and glass in running colours are made in Lorraine, Cologne and Silesia.

Glass staining is executed for churches in the traditional style (Berlin, Munich, Offenburg, Freiburg). Great development is to be observed in the vitrification with partly American glass, according to sketches in modern placard style.

Glass mosaics are now executed in exactly the style of the old Roman and Venetian mosaics (Berlin, Mettlach), so that assistance from Venice can be dispensed with even in carrying out the most extensive orders. The necessary glass liquids too are made in Germany.

Leather enjoys the greatest favour next to wrought iron. It is pressed, cut and easily coloured. The patterns have broken free from historical dependance, and follow a broad path with a predilection for the study of nature (Hamburg, Munich, Berlin).

In the textile art, clothing stuffs follow in the wake of international fashion. Silk and velvet weaving (Crefeld and Elberfeld) supply the more durable and simpler patterns in large quantities for abroad, and modern patterns of artistic design for neckties, blouses, &c. Very rich patterns for limited use are only exceptionally executed. The present fashion of embroidered tulle and gauzes is very detrimental to the silk industry.

For church ornaments the most splendid patterns of the middle ages have been adopted with perfect success. Silk and woollen stuffs for furniture are for the most part adorned with light flower patterns and peculiar modern forms and light colours are coming into favour.

The linen weaving industry has a rich treasure in its old damask patterns with loose flower work which need no essential change to make them suit every style. The old German edge patterns are falling somewhat into the background.

As regards treatment with colours, machine embroidery offers greater advantages than the weaving of coloured stuffs, in which it is difficult to leave fairly large spaces white and restrict the pattern to definite spots.

For carpets, knot work (Smyrna style) has been largely adopted. At first great success was obtained with the old oriental patterns. Attempts to supply special carpets after the style of the 18th century were not, in spite of a large turnover, of lasting duration. They were lately relieved by attempts to work in modern style with broken colours and undecided patterns.

Tapestry and furniture coverings are being worked in Berlin (Ziesch) exactly like French Gobelins. Besides this there is a simpler kind, similar to the northern peasants' weaving work, especially to the Swedish, which has now gained an independent position in modern placard style, and which has spread far and wide. The suburb of Scherrebek in Schleswig-Holstein was for some time the seat of many amateur workshops in this industry.

Curtains in the form of thick front curtains which were formerly used to cover windows with, have entirely disappeared.

Embroidery has developed in a most brilliant manner. All the old styles are reviving. They are sufficiently well understood for all effects desired to be obtained even according to modern tastes. Machine embroidery is made much more serviceable for artistic demands by the crank machine worked by hand. Pieces for furniture and clothing ready cut to pattern are manufactured wholesale, so that this kind of decoration which was formerly so expensive has become common property, and is making great progress in patterned goods.

Lacework has made similar strides. With the help of the embroidering machine, threads and odds and ends are converted into trimmings which can be used quite well for skirts.

Lace is prepared in countless quantities by machines, and mostly consists of lacelike embroidery on ground that is etched away afterwards, and is produced in an endless variety of old and new patterns with the most brilliant effects. Silesia (Plauen) is the chief seat of this industry.

In conclusion, a ferment of life and activity prevails in all the branches of art industry, and no doubt exists that the tendency for original modern styles is advancing; everywhere where a change in modern requirements make special efforts necessary, invention and execution are lending a helping hand to solve the tasks which arise.

Julius Lessing.

BOOK INDUSTRY.

1. Economical and Technical Aspect.

For about the last twenty years, all those trades which are directly or indirectly connected with the production of books, their printing, publishing and circulation, have been united under the name of the "Book Industry."

The "German Book Trade Union," comprising all these branches, was founded at Leipsic in 1884 for the artistic and technical promotion of the entire German book trade, and applied itself especially to increasing the influence of graphic art on this branch of industry. This purpose has been partly fulfilled by a series of collections which were made, and which, combined with the "Royal Saxon Bibliographical Collection" in the "German Book Industry Museum," contains everything of special value for the artistic, technical and graphic development of a book. In addition, however to the permanent exhibitions in its own buildings, the "German Book Trade Union" furthers the interests of the industry by instituting large and small travelling exhibitions of various branches of the graphic arts and crafts, within the German Empire.

Furthermore it aims at establishing a co-operative participation of the German Book Industry in special exhibitions in Germany and other countries, as also in international expositions.

In 1893 the Union was commissioned by the German Government to organise and arrange a collective exhibit of the German Book Industry at the Chicago World's Fair, in 1897 it organised the book-trade section of the Saxon Thuringian Industrial and Trade Exposition, which was accommodated in a space of about 2,000 sq. metres, and in 1900 the Union was entrusted by the Imperial Commissioner with the management of the book trade group section of the German Department at the World's Fair in Paris. It may therefore be regarded as a special mark of confidence in the "German Book Trade Union" that it has not only been officially requested to manage the department devoted to the book industry in the St. Louis Exposition of 1904, but also to take charge of the photographic department there. The "Pattern

Exchange," established and published by the "German Book Trade Union," is a prominent educational factor in the cultivation of artistic taste in this branch of industry. Every member consents to furnish a model sheet of prints, of lithography or chromo-lithography, a copy of half-tone etching, or a heliographic chromo, &c., in an edition corresponding to the number of participants. In return each member receives the same number of various patterns. Foreign countries participate actively in this important enterprise, the tenth volume, of the "Exchange" published in 1902, showing that of 187 firms participating, 86 were foreign ones, of which 30 were resident in America. The official journal of the Union is called the "Archiv für Buchgewerbe," founded in 1863. It is published monthly, and contains detailed and lucid accounts of all technical and art occurrences in the book industry. The city of Leipsic having donated ground valued at 200,000 marks and located near the German Booksellers' House, the Union, aided by members of the book trade, was able to erect a structure suitable for their requirements, the cost of which amounted to 1 million marks. This building contains exhibition and museum rooms, reading and drawing halls, the offices of eighteen book associations, the Gutenberg Hall dedicated to the great inventor and other famous men in the book trade of all nations.

The following branches of the extensive German book trade deserve special mention:

The Publishing Trade, which is occupied in buying, printing and circulating literary productions. The German book trade is divided into actual publishers and booksellers, music, art and map publishers. The chief branches of the book trade are as follows: the publisher, the bookseller, the colporteur or itinerant bookseller, and the second-hand bookseller who is generally in connection with a retail bookseller and with agencies and auctions. The directory of the German Book Trade (published at Leipsic) for 1904, shows a total of 10,624 German booksellers at home and abroad. Of these, 2,612 are occupied only in publishing books, 340 only in publishing works of art, 397 only music, 138 chiefly with art works, 464 chiefly with music, 224 only with second-hand trade, 6,184 with books, second-hand books, itinerary trade, music, maps, paper and writing material, as well as 265 that are established as agents and newspaper offices. 2,579 foreign publishing firms have agencies in Leipsic, from whence all or part of their publications are supplied.

The foreign and home German booksellers are divided as follows: German Empire 1,481 towns with 8,207 firms, Austria and Hungary 281 towns with 941 firms, the remaining European states 277 towns with 1,230 firms, America 53 towns with 178 firms, Africa 9 towns with 19 firms, Asia 16 towns with 39 firms, and Australia 7 towns with 10 firms.

The publisher creates the trade, inasmuch as he buys the manuscript from the author, undertaking to have it printed and offered to the public. In a contract between publisher and author the number of copies of the edition, the price of the work, the printing, binding, and date of the appearance of the book have to be agreed on. In many cases the publisher under-

takes work on account of third persons; this kind of work is known as the commission publishing trade. It must be borne in mind that in many cases the publisher takes the initiative and furnishes the idea and tendency of the book, thus becoming to a certain extent its originator. The production of the book publishing trade, as far as is known, in the regular course of business during the last five years was as follows: in 1898: 23,739, 1899: 23,715, 1900: 24,792, 1901: 25,331, 1902: 26,906 numbers.

The bookseller is the link between the publisher and the buyer; he orders the books which suit his business and speciality from the publisher, sends them to those of his customers whom he supposes will take an interest in the work, and procures such works which he has not got in stock.

The colporteur bookseller differs from the above in selling books by sending his travellers directly to the customers. This itinerant bookselling business has grown very much of late years, and deserves our consideration as long as it is used for selling good books and periodicals. The second-hand dealer sells older books which are no longer in print, though of late years the trade has been extended to the sale of modern second-hand books.

The second-hand bookseller occupies himself with trading in old books, no longer in circulation; modern books have also, however, been added by the second-hand dealer to his stock, and he does his business by means of scientifically arranged catalogues, which he offers to the public, booksellers and other second-hand dealers; he also attends auctions, and trades in autographs.

The music publisher's business is done on the same lines as the book publisher's; besides bringing out new modern music, he publishes new editions of classical works in all kinds of forms from the most splendid to the cheapest popular edition. These editions of classical works have been so carefully arranged within the last ten years that they are now first in the market of the world. The following figures show the briskness of the music publishing business in the last five years and the number of novelties offered—1898: 12,596, 1899: 11,542, 1900: 12,272, 1901: 12,376, 1902: 12,588 Works published.

The music seller's business is done much in the same way as that of the book-seller.

The commission agent transacts the internal business of the trade. The centre of the book trade is Leipsic, and the publisher and seller are in constant communication with that place all the year round. Every man engaged in the book trade must have a commission agent at Leipsic, whom he publicly acknowledges as his representative, and who can act for him on the spot.

The following book agencies were established in Germany in 1904: Leipsic 153 commission agents representing 9,373 principals, Berlin 38 commission agents representing 344 principals, Stuttgart 12 commission agents representing 679 principals.

The newspaper publishing trade is very thriving. At the beginning of 1903 there were about 12,400 periodicals and newspapers; the publication of scien-

tific periodicals is very important, and Germany is probably unrivalled in this branch; among the political papers are some of the oldest in existence, such as the "Magdeburger Zeitung" founded in 1626, and the "Leipziger Zeitung" in 1660.

The organization of the German book trade consists in the combination and regulation of the business between the publisher and bookseller at the central market Leipsic; circulars of all new publications and announcements issued are sent to the commission agents; these they send on to the booksellers; vice versa the bookseller sends back all books not required through the commission agent to the publisher, and all payments are made through the agent. All lots have to be sent free of charge to Leipsic, and all money paid through the agents in the same way.

A great part of the correspondence within the trade is done by means of the "Order Institute for Book Trade Papers," founded by the Booksellers' Union in Leipsic 1842, and located in the Booksellers' House. This is a very important department, for there are fifteen sorters occupied solely in putting the papers in order. The number of circulars, order forms and contracts amounted in 1903 to 35 millions.

The official periodical of the German book trade, sent to members only, was founded in 1834, appears six times a week, and is called the "Börsenblatt für den deutschen Buchhandel."

The co-operative exertions of the German book trade are centred in the "Exchange Union of German Booksellers" founded on the 30th April 1825, an institution which affects the whole world where trade is done with the German book industry. In a great many places the district and parish unions act as organs for the Union, though in nearly all larger villages and small towns there are booksellers' societies. At the beginning of 1904 the Exchange Union numbered 3,080 members. The "German Booksellers' House" belonging to the "Exchange Union of German Booksellers", and situated next door to the Book Industry Building, was finished in 1888 and cost over a million marks. The booksellers' fair takes place once a year. On the fourth Sunday after Easter there is a general meeting held of the "German Booksellers' Union." The following days are taken up with the comparing and adjustment of the bills and business done in the preceding year.

The united efforts of the music sellers resulted in the "German Music Sellers' Union," which was founded at Leipsic on the 23rd May 1829, and exercises its influence wherever the German language is spoken. At the beginning of 1904 it numbered 348 members.

For the professional training of booksellers' apprentices there is in Leipsic a public "Booksellers' Training Institute" supported by the Booksellers' Union of that town.

The Relief Association of German Booksellers and apprentices in Berlin, and the General Union of German Booksellers' apprentices in Leipsic provide aid in cases of distress among the members and their families. The membership of the former association at the beginning of 1903 was 3,007 and the

funds amounted to 650,000 marks. 58,600 marks were expended in relief. The General Union of German Booksellers' Clerks had a membership of 2,628 (at the beginning of 1903) and its funds amounted to 650,000 marks. During the year 1902, 72,000 marks were expended on relief.

The Art of Printing. In Germany, where the art of printing originated, it has developed to such perfection that its productions can compete with those of all other cultivated lands. The art of printing in modern times is not confined as formerly to printing with movable type and pictures, but employs for many productions all the reproductive methods of graphic art. The result is that a large number of establishments at the present time are not mere printing shops, but book industrial establishments in which printing shops, type foundry, graphic art, stone and copper engraving, book-binding, &c. co-operate successfully. The first and largest printing establishment in the German Empire is the Imperial Printing Establishment in Berlin, which is chiefly engaged in producing Imperial bank notes, Imperial treasury bills, Imperial post-office stamps, insurance stamps, revenue stamps, savings-bank stamps, promissory notes, interest tables, &c. The printed matter averages 180,000,000 sheets annually, the number of officials, artists and workmen being about 1,700. The book industry is indebted to the Imperial Printing Establishment for experiments of various graphic arts, trials of new methods and the production of new patterns, type and ornaments.

From a technical standpoint the German art of printing ranks very high. The latest mechanical inventions and the most approved printing methods are employed in most medium-sized and large establishments, and experienced workmen enable the German book industry to produce such excellent results, that even foreign countries recognise their merits.

Printing is chiefly employed for publication purposes, i. e. for the composition of type and the printing of literary works designed for publication. On account of the great publishing activity in Germany this branch of industry is very prosperous. Furthermore a considerable number of foreign works are produced in the German Empire, and Germany ranks first among all civilized countries in printing oriental works (for foreign countries). In most cases, the order requires good, clear print, which generally distinguishes German publications. If no economy is required in fitting out works, the most difficult sorts of printing are performed in the best style.

Job work, which includes all kinds of printing except publications, newspapers and illustrations, equals publication printing in the extent of its operations; it is quite probable that the activity in this line exceeds all others. As far as artistic results are concerned, German job work can bear comparison with that of any foreign country, taking into consideration, that as a rule only a very short time is given for the completion of casual work. Not only type-setting and printing, but also designing as well as all sorts of graphic printing processes are employed in artistic job work, and an extensive use of colour printing is also made. Owing to the instruction

in decorative printing given by artists and art experts, the technical and artistic execution of German job printing has of late attained great perfection.

The printing of illustrations ranks very high, that for illustrated newspapers being especially so excellent that it cannot be surpassed by any foreign country. Especial attention is given to the printing of coloured illustrations, and this work is gaining in popularity. The book printing-press surpasses the stone printing-press in producing large editions, so that coloured printing is very generally employed in book illustrations, and especially in newspaper illustrations where large editions are required. Several firms produce such excellent results in three-colour printing, whereby original colours of various hues are produced from three plates printed in the three ground colours, red, yellow and blue, that they receive a large number of orders from foreign countries.

The perfection of these branches of the German book industry is largely due to the industrial training of all employed in the trade. For the education of apprentices there are special schools in Berlin, Breslau, Hamburg, Elberfeld, Magdeburg, Leipsic and Stuttgart. The Royal Academy for Graphic Arts and Crafts in Leipsic has educational departments for printing, book-binding wood-carving, lithography, steel-engraving, stone-printing and etching, as well as for the mechanical processes of photography; there is also a course for industrial designing. Typographical societies exist in almost all large printing centres, which aid in the education of printers by instituting lectures, libraries, collections of patterns and courses of study in graphic art.

The German Printers' Association in Leipsic represents the interests of its members in state affairs, and regulates the question of wages. At the beginning of 1903 it numbered 1,100 members, or almost 2/3 of the craft belonged to it. The interests of printers are represented by the German Printers' Union in Leipsic, with a membership of 36,000 and funds amounting to 21/2 million marks. The Compulsory Accident Insurance is managed by the German Printers' Trade Association, showing a membership of 5,900 at the beginning of 1903, the number of persons insured being 114,577. The amount of damages paid in 1902 was 332,930 marks.

The Corporations of Proprietors of Printing Establishments in Berlin, Brunswick, Dresden, Hamburg, Leipsic, Luebeck, Magdeburg, Osnabrueck, and Wiesbaden, as well as associations of printing house proprietors which exist in various large printing centres, represent the interests of the book industry within their respective districts. The Free Sick-Fund Association ("Freie Vereinigung unabhängiger Viatikumskassen", not members of the Union) is interested in regulating all relief matters by the introduction in every local association of reciprocal measures, and secures proper aid for its members' fund even if they change their place of work.

Stone Printing, Lithography and Chromo-Lithography furnish employment for a large number of firms, and their productions have an excellent reputation in all countries. Stone printing (Lithography) is still used for one-colour work, but coloured stone printing (chromo-lithography) has de-

veloped and attained such a high pitch of excellency that many German chromo-lithographic establishments work almost exclusively for foreign countries (America and England). The cartographic process, based on the principles of stone printing, has grown to remarkable proportions in Germany and foreign countries. A number of large establishments are occupied solely in producing globes, cards and maps, their execution being faultless. The printing of music, in which stone printing is an important factor, has attained a degree of perfection that cannot be excelled by any other country. The largest part of musical works in the whole world is printed in Germany. The present condition of stone-printing is regulated by the Association of German Stone-Printing-House Proprietors in Leipsic, which showed a membership of 400 at the beginning of 1903.

Type Founding, Manufacture of Brass Rules, Electrotype and Stereotype Making are constantly increasing in prosperity. The products of the two first-named branches are largely exported to foreign countries, especially artistically ornamented type which increase the capabilities of the job printer and his love of work. Several German type foundries, aided by artists, have produced type in the last years which is of unexceptionable superiority. Electrotyping has progressed so extensively during the last few years that every large printing establishment is provided with electrotyping plant. For the requirements of medium sized and small printing houses there are special electrotyping establishments, whose productions satisfy the most pretentious claims and are obtainable in the shortest possible time. Stereotypy is so extensively employed since the introduction of practical and cheap apparatuses, that almost every printing establishment possesses a special stereotyping plant.

The Association of German Type Foundries, founded in 1902 at Leipsic, represents the interests of German Type Foundries. It has 36 members.

The Art of Wood Cutting occupies the highest rank from a technical standpoint without deteriorating in artistic qualities. Its chief field of activity is the illustration of newspapers and the production of technical plates, whereas wood engravings in publications have been superseded by photo-mechanical productions.

The Photo-Mechanical Process (half-tone etching, heliography, photo-lithography and zincography) has constantly improved and developed during the last few years, so that the productions in this line are ranked among the best in the world. In addition to the department for photo-mechanical work in the Royal Academy of Graphic Arts and Crafts at Leipsic, there are two private establishments engaged in experimenting with photo-mechanical work and in giving instruction. The "Association of United German Chemi-graphic Institutions" founded in Berlin at the beginning of 1903, represents the interests and endeavours to promote the technical development of photo-mechanical work.

Wholesale Bookbinding. The uncommonly brisk state of the publishers' business has resulted in the development of what may be called wholesale bookbinding, a trade which is chiefly represented in Berlin, Leipsic, and Stuttgart, though its customers are not only to be found throughout the

Empire, but also over the whole world. In Leipsic there are establishments which have over 100 machines and employ 300 people. Other bookbinders' establishments also do very good work, in which they are assisted by the existence of six private schools for bookbinders.

The Association of German Book Binders at Leipsic regulates all industrial and wage questions. The membership in 1903 was 90.

The Art of Engraving. There is only a small number of establishments for this art, as far as it is related to the bookbinders' trade, but the results are all the more excellent. For some bindings engraved plates are required which have to be so faultlessly executed that in printing with the several plates above and adjoining each other, each colour must be so exactly covered by the one above it that no irregularities can be detected on the finished cover.

The requirements of the book trade have given rise to a special machine industry in Germany, which has quite a large working area, and supplies firms both at home and abroad. The printing machines made by König & Bauer at Kloster Oberzell near Würzburg, by the Maschinenfabrik Augsburg in Augsburg, by the Maschinenfabrik Johannisberg of Messrs. Klein, Forst & Bohn Nachf. at Geisenheim-on-the-Rhine, are to be found everywhere, and Karl Krause at Leipsic has customers all over the world for his bookbinding and paper-cutting machines, of which the firm has made a speciality. A few statistics will help to show the present state of the German book industry:

The thirteen Great Printing Centres of the German Empire, with a List of the Book Industry Establishments, and the Persons occupied in it, for the year 1895.

Place	Book-binding		Type Founding and Wood Engraving		Printing		Lithography and Zincography		Copper and Steel Printing	
	Establ.	Persons	Establ.	Persons	Establ.	Persons	Establ.	Persons	Establ.	Persons
Berlin	880	6,064	100	851	541	11,687	324	2,406	23	99
Bremen	60	228	1	3	40	586	32	283	—	—
Breslau	120	683	5	42	81	1,326	52	608	—	—
Cologne	114	360	7	20	89	1,731	53	280	2	7
Dresden	211	868	18	81	104	1,957	94	541	4	4
Frankfort-on-the-Main	109	406	19	527	100	1,250	74	961	5	9
Hamburg	218	756	14	157	193	2,187	144	754	4	12
Hanover	82	948	7	59	60	1,358	28	748	2	4
Leipsic	247	4,381	129	1,497	170	5,641	181	2,345	12	124
Munich	216	1,035	48	127	99	1,791	72	730	32	232
Nuremberg	83	555	10	45	39	787	71	1,384	24	86
Strassburg, Alsace	52	167	3	12	20	774	15	148	—	—
Stuttgart	103	1,345	44	308	67	1,659	59	424	6	6

Place	Colour Printing		Photography		Book and Art Trade		Lending Libraries		Newspapers		Total	
	Establ.	Persons	Establ.	Persons	Establ.	Persons	Establ.	Persons	Establ.	Persons	Establ.	Persons
Berlin	71	545	22	80	1,034	3,759	18	22	371	2,767	3,384	28,280
Bremen	—	—	33	101	49	178	1	1	3	10	219	1,390
Breslau	4	162	66	232	148	536	1	1	24	70	501	3,660
Cologne	2	17	61	157	125	351	2	3	15	152	470	3,078
Dresden	19	801	92	457	264	754	34	54	53	219	893	5,826
Frankfort-on-the-Main	7	551	56	194	151	378	2	8	33	228	556	4,512
Hamburg	2	9	137	351	278	680	28	105	234	760	1,252	5,771
Hanover	—	—	56	183	121	316	5	12	12	83	373	3,711
Leipsic	38	1,931	71	296	543	3,314	11	11	80	256	1,482	19,796
Munich	22	106	105	554	313	853	6	8	186	323	1,099	5,759
Nuremberg	21	532	44	137	52	236	—	—	20	69	364	3,831
Strassburg, Alsace	—	—	29	90	49	153	2	2	9	118	179	1,464
Stuttgart	7	20	41	200	164	672	1	1	21	74	513	4,709

Number of firms in the German Empire connected with the Book Industry in the Year 1895, with a List of the Persons employed, and the Amount of Working Power used.

Name of Trade	Industry altogether	Chief Establishment	Secondary Establishment	Horse power used	Persons concerned in the trade
Bookbinding	12,850	12,073	787	3,592	49,771
Type Foundries and cutters, Electrotype Institutes, Music Engraves, Chemitype and Woodcutting	589	536	53	576	4,572
Bookprinting	6,303	6,022	281	13,592	80,942
Lithography and Zinc printing	2,733	2,592	141	2,828	22,805
Colour Printing (Coloured prints, Chromo-lithography, Illustration prints, Maps, Labels, &c.)	317	293	24	1,309	6,794
Copper and Steel Printing	185	161	24	134	853
Photography (Photo-lithography, Photo-zincography, Chromophotography, Heliography)	4,963	4,589	374	193	11,901
Books, Art and Music Shops, incl. of publishing and second-hand	9,902	8,425	1,477	—	24,692
Lending Libraries	287	193	94	—	367
Newspaper publishing and Agencies	2,387	1,754	633	290	9,940
Total	40,526	36,638	3,888	22,314	212,637

Import and Export of Book Industry Products in the Years 1898–1902.

Year	Printed works		Reliefs, Print and Stereotype plates		Calenders		Books, Cards, Music Prints, &c.		Coloured Prints, Copper and Steel Engravings, Lithographs, Chromolithographs, Heliographs, &c.		Playing cards	
	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export	Import	Export
	Doppelzentner à 100 kg		Doppelzentner à 100 kg		Doppelzentner à 100 kg		Doppelzentner à 100 kg		Doppelzentner à 100 kg		Doppelzentner à 100 kg	
1898	183	8,530	324	681	1,863	1,761	39,675	126,711	6,337	50,505	24	1,135
1899	186	9,450	392	922	1,951	2,115	42,942	126,167	6,694	54,223	29	1,271
1900	298	9,123	375	765	1,942	2,191	44,726	140,864	6,999	61,164	43	1,112
1901	193	8,149	334	650	1,930	3,104	46,133	141,772	6,740	59,916	20	1,180
1902	180	8,862	368	588	1,708	3,822	50,515	142,734	6,487	68,097	24	940

Arthur Woernlein.

2. Artistic Considerations.

The art of making a book an object of beauty has never stood higher than it did in Germany at the time when the art of printing was first invented. None of the successors of Gutenberg and his associates, either at home or abroad, have ever surpassed in strength or harmony the work which they executed when closely following the traditions of the old Gothic manuscripts.

The German Book-Art reached a second era of perfection during the period of the early Renaissance, when masters like Dürer, Cranach, and Holbein made an artistic use of the wood-cut which had been invented and perfected in Germany for the pictures and ornamentation of books. Their example was followed until the Thirty years War interrupted this progress like it did so many others. In the books of the 18th century the German copper-plate engraver rarely equalled his French prototype, although the animated appearance of the Gothic-letters and the plain style of ornamentation give evidence of the practical character of the trade in olden times. This extends through the classical period of German literature, for a whole generation, far into the nineteenth century.

German Book-Art underwent a transformation in the nineteenth century. Illustration, decoration and print were forced to follow historical styles which were laid down for them in rapid succession by architecture and the decorative arts. These tendencies are still partially apparent at the present time in the German book industry. Many styles have never disappeared, whereas others have recently been resuscitated and made fresh use of.

This is especially the case in regard to works of Romantic German authors, who since the thirties have contributed treasures of genuine German imagination, consisting of large illustrated works, editions de luxe and popular editions.

The classical style which regulated taste at the beginning of the century was not deep enough to influence types and setting very emphatically, the printers keeping to the pleasing traditions of the Gothic letters and simple setting. On the other hand this style showed its influence strongly in illustrations. The fresco painter and cartoon draughtsman Cornelius, as well as his friends, compelled the copper-plate engraver to give up all picturesque effects and confine himself to outlines. Such outline style has, however, fallen into disuse in the German Book Industry, and the outline engraving is only to be found now in a few costly books on architecture, compiled by authors who considered it a particularly distinguished kind of technique. The effects of the romantic time which began in the thirties were more lasting. The artists who illustrated the old legends and fairy tales and the young poets of the romantic school—Moritz von Schwindt, Eugen Neureuther, Adolph Schroedter, and others, particularly Ludwig Richter, the darling of the German public—knew how to suit their pictures to the ornaments and types of the time. To the Gothic running pattern they added firm medieval type in pleasing contrast to the thin Gothic letters. They treated illustrations from a draughtman's and not from a painter's point of view, either etching them in copper or drawing them on stone, or having their designs reproduced by wood-cuts. Rethel, Schnorr von Carolsfeld and others reintroduced outline wood engraving for larger works and pictures. Adolph Menzel, who served his time as a young lithographer of artistic book-ornamentation, struck out a new line in his illustrations to the History of Frederic the Great with a picturesque style of drawing which created a new school for wood engraving.

In the sixties the Mediæval style was followed by the New Renaissance.

Since the founding of the new German Empire, the style called "Old German," a variety of the above, has ousted its competitors. The rise which industrial art took in those years bears fruit in the artistic development of books and type till the present day.

The type foundries returned to the old form of German type, especially to the strong and picturesque "Schwabacher." Artists such as Rudolph Seitz, Peter Halm, Otto Hupp, E. Doepler the younger, and others who had devoted themselves to the study of the old masters, were found to reform book ornamentation, both in drawing and type. In Munich, Mayence, Leipsic, Berlin and other places the Old German style was cultivated and adopted by the better printers for job-work and ordinary printing, and still remains popular. The wholesome principles and the lively effect of this renaissance style is evident in many editions of the classical and modern poets. The more severe Gothic art was retained for ecclesiastical and liturgical work.

German bookbinding participated in this rise. The old patterns called forth the idea of working single samples with hand gilding and leather

mosaic. As the number of wealthy book-lovers is small, artisans confined themselves more to job-work suitable for testimonials and presentation copies than to costly bindings. Publishers began to bring their products to the market in a more ornamental and decorated form, in linen and half-calf bindings. The old patterns were imitated, and hand-gilding in neat pressed work was sometimes done by very skilful hands. Besides the bookbinding branch the art of leather cutting has been carried to great perfection since the seventies, when it was first revived.

Side by side with the taste for old German print, the appreciation of the Latin type was nourished, and Latin and German type are no longer mixed indiscriminately.

It may be remembered that Jacob Grimm, the old German philologist, was greatly in favour of Latin types. Since that time such type has been very much used for scientific, business and many other purposes. Artists and type founders took up the study of the initial letter to which Albrecht Dürer had already given so much thought. The severe cut of modern Roman letters was replaced by softer and more regular mediæval and renaissance shapes. The Imperial Printing Office has set a good example in this respect.

The different tendencies of the letter press found a large field for expansion in the growing importance of the publishing trade, and went hand in hand with the progressive movement of illustrative technology.

Picturesque wood engraving was toned down to great refinement by the aid of good artists and influential schools. The illustrated papers in Leipsic, Stuttgart, Munich and elsewhere, take the lead, particularly in the wonderful reproductions of pictures and water-colour drawings.

Berlin is the home of the coloured wood-cut. The wood-cut can only maintain its ground with greath difficulty for more intricate and more artistic work, as the cheaper photomechanical processes have obtained great recognition for all kinds of simpler illustrations. Zinc-etching and half-tone-etching done by means of a net—the invention of Meisenbach of Munich—and grain-etching done in copper and zinc have been brought to great perfection. Of late years much work has been done concerning the exposure, the etching and the printing from etchings in several colours, and more especially in three colour chromotype.

The photo-type process developed more quickly in Germany than half-tone etching. Architectural plans and designs for industrial objects of art were freely circulated by that means, and the process was successfully applied to the reproduction of coloured pictures and drawings by old masters and modern painters.

Some fine results have been obtained by photomechanical copper printing. After having been successfully employed for the reproduction of old engravings, hardly to be distinguished from the originals, this fine process was used for the reproduction of pictures by old and modern masters, and comprehensive series of pictures belonging to public galleries have been published. The Imperial Printing Office has done exquisite work in that line. Publishers have

taken up photogravure very eagerly, especially for large, "Editions de luxe." Besides these mechanical processes, which, in spite of their photographic foundation require constant artistic supervision, the hand work of the lithographic colour-print has not only kept its place, but even increased.

The German chromolithographs have been celebrated for years for their faithfulness of reproduction and their exactness in scientific and artistic work,—advantages which have been useful in the production of the facsimiles of oil and water colour paintings. World-wide fame has been gained for this industry by the production of small advertisement cards. Though they must conform to the wishes of the customers, the taste and skill of the workmen producing them has improved to a satisfactory extent. Of late photography has been used as an auxiliary to lithography.

All these processes, in which progress is still being made, have procured the German publishers a good repute which is not confined to one branch only. In the last decades all branches of the book trade have made use of the increased facilities for illustration. Scientific literature has been enriched by the beauty and correctness of the plates, and by the faithful reproduction of object lessons from nature, technical engineering, art, history, and from every other branch of learning. Not only books but periodicals and dictionaries have been greatly improved by the new methods. The literary publisher has been able to keep artistic ends in view in publishing illustrated editions of German or foreign classics and modern writers. "Editions de luxe" of patriotic and historical works have been published, and essays on countries and nations, art and nature. Colour-printing has also specially influenced the production of children's picture books. The popular illustrations by von Werner, W. Friedrich, P. Thumann and others led the public taste in drawing as well as in painting. The clever caricaturists Busch and Oberländer restricted themselves to drawing.

In the meantime type-founders and printers have enriched their store of technique and design. Since 1880 they have adopted the baroque and rococo styles, and successfully applied the so-called "free-hand style" which had been started in other countries. The latest turn in the German book trade is a result of the opposition to this; it is intimately connected with the new movement in industrial art, and aims at the simplification of super-refined technique, and the limitation of overgrown ornament.

The book industry, similarly to industrial art, has been given new tendencies by individual persons, generally artists. Workmen, printers and publishers compete with artists at the present day in the promotion of this industry.

It is difficult to review this new kind of work. There are no schools or groups,—only personalities. No special styles have been developed by different cities. The artists are of a wandering tendency, and a capable printer or a publisher with refined taste is only found by chance. The young painters are mostly educated in Munich, whereas Leipsic and Berlin occupy the first place in printing and publishing; groups of artists live in Carlsruhe, Darmstadt and other localities. Germany is justified in being proud of its many prosperous art centres.

Graphic illustrative art, book and art printing are associated in the new activities.

Artists of repute took the iniative in elevating the different methods of Graphic Art above the ordinary trade standard to which it had sunk, by participating actively in the work. Twenty-five years ago Max Klinger was successful in restoring original etching to its position among the great arts. Several Hamburg artists have occupied themselves with decorative wood cuts in Japanese collections in their native city: Otto Eckmann, Peter Behrens and others may also be mentioned. Albert Krüger has produced copies of several works of old masters in exquisitely coloured wood engraving.

The work of the last century in the domain of original lithography has been excellent. Masters possessing unique talent have placed the results of their fancy and observation on stone, among others Otto Greiner, who approaches Klinger's style. Others have remained painters, but contribute also to the collector's portfolio, and for wall decorations, graceful and effective, generally coloured sheets. A group of such artists have formed an artists' union in Carlsruhe, and opened a workshop of their own, in order to be independent from a technical standpoint. An instructive field for frequent experimenting in this original art has been the production of advertising placards. The best German artists have recently completed a series of coloured wall pictures for the school and home, and these surpass everything of the kind in other countries.

The example set by artists has favourably influenced industrial activities, manufactories demanding better patterns and drawings and new colours. This tendency is traced even to the popular post-cards.

The coloured poster offered a new sphere on a large scale for the draughtsman. The decorative turn evident in all these branches of art has been everywhere turned to good account, and has even influenced the processes of mechanical reproduction. The consequence of the success of the poster is that book-covers, music, title pages for newspapers, are all ornamented with a few bright colours, sometimes by the same artists. Since 1895, two periodicals, "Pan" in Berlin and "Jugend" in Munich, have struck out a new line. Periodicals for wit and humour have taken advantage of the new printing methods, and several first-class artists have appeared (Ed. Thöny and others). These are the best German illustrators at the present time.

In books, however, all the best artists have agreed not to give illustrations a prominent place, but to furnish the text with decorations. Such decorative effects, a combination of text and picture, take the lead. Anyone who wishes to distinguish himself can be original, decided and German, even within these bounds. This is proved in Joseph Sattler's beautiful and noble art productions. His "Nibelung" is unsurpassed in the book art of all ages.

Artists of the most varied talents and tendencies are occupied with books in Germany: Melchior Lechter, a Gothic artist; E. R. Weiss, the friend of German folk and peasant style; H. Vogeler, an artist of fine imaginative talent; J. V. Cissarz, a graceful decorator; Peter Behrens, a strict rhythmic artist; and many others possessing like styles.

The strength of the new German book art is to be found in the great variety of its styles.

These artists are chiefly occupied with works of living and dead poets; also with books designed for festival occasions. The best works owe their productions to a few publishers noted as prominent friends of art. The printing is done in houses of the same character, of which there are only a few in existence. During the last five years ordinary printing houses have improved considerably in style. The systematic activity of the German Book Industrial Association in Leipsic has interested and directed extended circles belonging to this branch of industry. In addition to several experienced offices, a number of young printers and a new group of artists have made the most progress. The teachings of the old masters of the art of printing are again comprehended, approved of and applied in the works of modern times. Attention is given to a strong combination of colours, limited use of surface ornamentation and harmony of type and decoration.

This work of the printers is well supported by the German type foundries. For many years no such variety of new, unique type has appeared as during the year 1900, Gutenberg's anniversary. An endeavour was made to render the Latin and German type hitherto in use fuller, stronger and more unique. An attempt was made to overcome the dry, mechanical, lifeless features which adhered frequently to the type of the 19th century. German work has also still higher aims. The German nation is the only one in Western Europe, which possesses a type of its own. There are many circles which recommend the adoption of the Latin type; there are however many friends of art, influenced not only by patriotic but also artistic reasons, who have no desire to forfeit the many superiorities of the type hitherto in use in Germany in order to be rid of its disadvantages. It is their opinion that the Gothic type is more unique and animated from an artistic point of view, and possesses more character. They call to remembrance the fact that the Gothic type has not been forgotten even in foreign countries. They are therefore endeavouring to enliven the styles hitherto used, Gothic and Schwabacher, and also to resuscitate the more simple Gothic and half-Gothic forms used in the time of Gutenberg. The first important work printed in this style was the catalogue for the German Empire for the Paris Exhibition in 1900, printed by the Imperial Printing Office, with type designed by George Schiller. The type was suited to the German, French and English editions.

Genuine artists have become interested in the various styles of type, this constituting the most difficult task in decorative art. These have been aided by a number of type foundries whose proprietors possessed courage and fine feeling. Otto Hupp, Peter Behrens and Heinz König are worthy of mention. A decorative type, possessing a strong, unique surface effect, was produced by Otto Eckmann, whose artistic career was recently cut short by an early death. A brisk, earnest spirit of competition prevails at the present time in German typographic art; the German type foundries allow no foreign establishments to excel them in artistic productions.

German book-binding has not as yet received sufficient orders for single valuable works, as the small circle of friends of art increases very gradually. Prosperous wholesale book-binding establishments endeavour to satisfy the claims of the new styles of art. They are abandoning the coarse effects which might be produced by coloured print and excessive gilding, and are employing carefully chosen and moderately decorated genuine stuffs.

Leading artists are occasionally engaged in such establishments.

The year 1904 finds German book art hard at work. All the technical results attained during the 19th century must now be converted into artistic results. Justly considered, this work is a struggle, but one that will surely lead to victory.

Peter Jessen.

PHOTOGRAPHY AND PHOTO-MECHANICAL PRINTING PROCESSES.

The photographic industry cannot be compared either in size, importance or extension to the greater industries. The whole value of its productions is but trifling in proportion, for instance, to that of the chemical industry. During the last ten years however enormous strides have been made, and photographic productions have acquired a well merited reputation in the world's market. The development of the photographic industry coincides with the invention of the dry plate. By means of the dry plate, the possibility arose of rendering photography more popular, and the last decade has seen the expansion of this process in a quite unanticipated and rapid manner. In Germany the camera is the constant companion of a large number of the educated classes, and although the photographic industry only partly owes its origin to the general spread of photography, still its speedy development is greatly due to the same. On the other hand, however, this speedy development can be traced back to the progress made in reproductive processes. Photo-mechanical book-illustration has especially been brought to a high state of perfection in all civilised countries, and its productions take an important place among the means of illustration. The value of the photo-mechanical

reproductive process for the history of civilisation is due to two circumstances; firstly, that it can supply an objective photograph of the illustration, secondly, that its productions are superior to and less costly than any that can be obtained from the hand of an artist or technologist. Wood-cuts, lithographs and copper-plate engravings in their different variations have competed with the mechanical reproductive process in a struggle, the energy of which has been nearly without a precedent; this struggle however terminated in a victory for the mechanical process wherever the older illustrative technologists could not hold their own by the merits of their art. To-day it is an accomplished fact, that mechanical reproduction, owing its origin and fundamental conditions to photography, has supplanted the old hand-reproduction process almost everywhere. The general use of photography, coupled with the extraordinary increase of illustrative material through photo-mechanical reproduction, has created the photographic industry in Germany.

The principal features of photographic achievements have changed with time. The portrait stood in the centre of interest thirty years ago, and in speaking of photographers one invariably meant portrait photographers. This kind of photography has however to-day become almost a thing of the past. In Germany, it is true, portrait photography as well as its mechanical application still plays an important role. The same also applies to that artistic and mechanical work which has only arrived at a state of perfection during the last few years; but taken as a whole, they have been pushed aside and have become less important for the photographic industry in the same proportion in which other photographic branches have come to the fore.

Professional photography is at present engaged in a very severe struggle. Its old representatives, who principally used photography from a technical-mechanical point of view in business, are in a bad position. The old traditions have receded more and more before the advance of new conditions. Neither has photography been spared by the tendency of the age, which has brought larger industries to the front to the disadvantage of smaller industries wherever the conditions for such a development were favourable. The average photographic productions in portraiture have sunk considerably in value to-day, and the simplification of photographic portraiture has naturally been accompanied by changes which from the standpoint of technical development cannot be regretted, but which have, however, resulted in the little portrait-studios of photographers being mostly replaced by larger industrial concerns combined with other mercantile businesses.

Thus some of the old representatives of portrait-photography have gradually disappeared, others only just manage to exist, whereas a small fraction have understood how to attain to that high perfection in their art which guarantees their thriving even under existing circumstances. Professional artistic portrait-photography originated from this movement, and its productions certainly deserve general interest. This pleasing process has been stimulated by the action of prominent amateur-photographers. Those amateurs who followed artistic photography as a hobby were able to give their ideas free scope, and

have thus shown professional photographers what can be achieved in the art; and if to-day our foremost photographers have risen to an unforeseen standard of artistic excellence, it is mainly due to the stimulus of such amateurs.

The possibilities of photography in serving science and technology through its objectiveness have also been increased. The triumphs obtained in this direction are great and numerous. Not only has reproductive photography largely increased, not only do its productions take a numerically favourable place in illustrating, but they have also considerably increased in value. In Germany the three-coloured print especially has reached a high state of perfection. In illustrating scientific and artistic works it now occupies an important place. The three-coloured print is adapting itself more and more in its productions to existing requirements, and the facsimile reproductions of even the most difficult originals are no longer impossible. Three-colour heliographic printing has yielded the most astonishing results in Germany, and having been developed on a purely mechanical basis it can now be employed in the most difficult work by reason of the improvement and perfection of its technic. In this branch, such names as Obermetter, Albert, Büxenstein, Schelter & Giesecke, Frisch, and others have obtained a universal reputation.

Some branches of photo-mechanical reproduction in Germany have passed through a stormy epoch of development, principally caused by the popularity of picture postcards. Large sums are turned over annually in Germany in their production, and still the demand increases. It cannot however be denied that the enormous quantity of picture postcards produced has to a certain extent damaged photo-mechanical reproduction and thus caused it to degenerate. This is particularly the case in heliographic printing, which the illustrated postcard has only affected as far as quantity is concerned. The prices have also sunk in an alarming manner through wholesale multiplication.

The mechanical reproductive process, in which a printing press is used, has lately met an unexpected competitor in the shape of the photographic rotary printing machine; this is a mechanical and chemical process in which bromide-silver-paper plays an important part, and was originally very limited in its sphere of activity. Germany formerly only possessed one establishment which produced the so-called rotary photographs in any quantity. To-day this establishment has not only increased its works on a large scale, but a number of other establishments have sprung up beside it as well; their number is constantly increasing, and most of these works are doing a large and successful business. The bromide-silver-postcards and other productions of this industry are sent by Germany to all parts of the world, and she dominates the greater part of the world's market in this article.

If we turn to the single photographic-chemical industries, we find foremost in Germany the manufacture of photographic-chemicals, plates and paper. The increasing development of chemical industry in Germany also causes its photo-chemical productions to enjoy a well deserved reputation. The manufacture of developers, precious metal-salts and other chemical preparations for photographic purposes, forms an important part of the chemical productions

of Germany. The number of chemical works which make a speciality of photographic preparations has considerably increased during the last few years, and whereas formerly almost only raw-material was manufactured, the manufacture of photographic solutions and preparations ready for use has made great progress. Hereby the requirements of amateurs have been met.

The German photographic dry-plate enjoys general favour. Germany exports dry plates to foreign countries from its large dry-plate factories, which for the most part work with great success. Austria, Russia, Norway and Sweden particularly, and to a smaller extent also France, are customers to Germany for dry-plates. The manufacture of colour sensitive plates, and so-called photo-chromatic plates for colour-photography, has received from German experimenters an epoch-making stimulus, and industry is striving to turn this recent success to the best advantage. The manufacture of dry-plates in flexible layers, so-called films, which were imported from abroad till recently, is now making favourable progress, and the home manufactures already deserve to be classed with those from abroad.

Photographic paper, the manufacture of which, thanks to the general use of albuminised paper, was formerly almost a German monopoly, is now no longer so. Chloride of silver-collodion paper, which partly ousted albuminised paper, and in particular, different sorts of bromide silver-paper, which enjoy increasing favour, are manufactured in equally good qualities in all civilised countries.

Chloride-silver development paper, after having been first manufactured successfully in America is gradually becoming more popular in Germany, and is produced in the best quality by German manufacturers. The manufacture of photographic apparatuses has now reached a climax of technical finish, and is largely carried on in Germany. The manufacture of first class apparatuses for all branches of scientific photography, for explorations and for the increasing requirements of reproduction-technology in Germany, is almost entirely carried on at home, and large numbers amounting to a considerable value are sent abroad. The industry in cheaper apparatuses of lesser value has especially increased and become more varied. The principal seats of manufacture are Leipsic, Dresden, Görlitz, Berlin, Frankfort o. M., Munich, &c. A distinct type of apparatus such as is made in America and England for the use of amateurs has not developed in Germany. On the contrary apparatuses of very different construction and shape are produced. From the expensive apparatus in the hands of the wealthy and earnest lover of photography down to apparatuses which with plate, paper and chemicals, are sold at a retail price of 30 pfennig, all kinds are supplied by German manufacturers.

In Germany the so-called folding camera (Klappkamera) is, in distinction to the peculiar type of English, French and American camera, much sought after, although cameras of the kodak type are gaining more and more. One can say in general, that the average sale price of German apparatuses is about equal to the average price of French apparatuses, and keeps above the sale prices of English and American amateur-apparatuses. German cameras

are as a rule less adapted to the purely mechanical and simple use of superficial amateurs than is generally the case with foreign manufactures.

The manufacture of photographic object glasses is of particular interest, not only because of their great value, but also because of the enormous progress shown in the scientific and technical workmanship of such productions. Steinheil who was the pioneer in the sixties and seventies in photographic optics, was followed in the eighties by Abbé and Schott who laid down its fundamental principles; on this foundation the development of the construction of photographic objectives, in which Germany took the lead, is based. Nowadays the older photographic types are only used for inferior and very cheap cameras in Germany. All better apparatuses are supplied with modern anastigmatic object glasses, which can be manufactured to-day at a comparatively low price, and in a very large variety of constructions. Side by side with the old firms in this branch, viz., Zeiss, Voigtländer, Goerz, and Steinheil, a series of young firms have lately arisen whose manufactures are highly commendable, and whose instruments, although comparatively cheap, satisfy the highest requirements. The production in Germany of modern first class object glasses has reached a high value, 15–20,000 of such instruments being produced annually, and sold not only in Germany but in all civilised countries. German object glasses are sent in large numbers to England, France, America, particularly however to Russia, Norway, Sweden, Austria and Italy. Japan also imports many German instruments. If an average price of 150 marks = £ 7 10/0 per objective is assumed, then the sale price of manufactured apparatuses amounts annually to 2–3 million marks. In addition to this the great mass of inferior and cheaper object glasses used for cheaper cameras must be taken into consideration. Their number will not be estimated too high at 100–150,000, and their average value is about 15–20 marks each.

In concluding this review some statistical data may be introduced which however can only lay claim to partial accuracy. The number of photographic establishments according to trade statistics amounts to about 5,000; 12,000 people are employed in them, and indeed in about the half of these businesses there is only one assistant. Stone and zinc printing is carried on in about 3,000 establishments employing about 23,000 persons, copperplate (printing) in about 150 places with about 800 workmen, and colour printing in about 300 places with about 7,000 workmen. Not all of these works devote themselves to photography. The number of photographic studios which only occupy themselves with the production of portraits in Germany is about 4,000 with a staff of 12,000 including owners and assistants. The heliographical printing works have grown considerably in number and size of late years. There are about 200 factories at work employing about 2,500 persons. 100 establishments are occupied with enlarging and retouching photographs, and in photographic rotary printing, at least 1,000–1,500 workmen are employed.

Photographic shops which look upon the selling of photographic productions as their chief business, number about 800, and there are probably about 4,000 persons occupied in these businesses. The photographic material

industry probably employs about 2,000 workmen. About 30 establishments with perhaps 2,000 workmen produce photographic object glasses. In the photographic plate and paper industry there are about 60 establishments, which give occupation to nearly 1,500 workmen.

Unfortunately it is not possible to find out how great the sale value of all the photographic products in Germany is; an approximate valuation amounts to between 30–40 million of marks. Though all the above statistics are somewhat uncertain, they suffice to prove that the photographic industry occupies an important place among the lesser industries in Germany, and that it has attained an honourable and even leading position in the world's market, which bids fair for its future healthy development and expansion.

A. Miethe.

MUSICAL INSTRUMENTS.

Judging from the many factories, their varied kind of manufactures, their output and large export trade, the musical instrument industry occupies an important position in the German Empire. All over the world German musical instruments are certain of finding a ready market, and as far as the value of their export is concerned, which has averaged 40 million marks annually during the last few years, no other country can compare with Germany.

The extent to which this industry has developed during the last thirty years is especially noteworthy, as it has been the means of transforming a large number of small works of modest pretensions into important factories fitted up with the most modern machinery and appliances. Although the German musical instrument industry, particularly piano making, could boast of very many noteworthy firms as far back as the last century, which did much to improve and develop the trade, it was yet very confined until after the middle of the 19th century. With the exception of Markneukirchen and Mittenwald violins, and Vogtland musical instruments, which found general favour at the London Exhibition of 1851, German musical instruments were very little known up till then in the international market.

A very marked difference was to be seen at the second London Exhibition in the year 1862. It was wonderful how every branch of the musical instrument industry had developed in so comparatively short a time. The German piano industry in particular had made great strides in its improvement, and it was then that the foundation stone of the export to England, which now yields the annual sum of about 13 million marks, was laid.

Several years later followed the political changes and establishment of the German Empire, which facilitated trading with foreign countries; the use of steam power and mechanical means of working also gave the industry a stimulus in the seventies and eighties, resulting in a sudden growth which has never been paralleled in the history of the industry either before or since.

Whilst the export of musical instruments from the German Customs Union in 1862 only amounted to 844,550 kgs, it rose in 1867 to 1,631,200 kgs, and the further increase of the export trade can be seen from the following list of figures derived from the export statistics.

In	Meter-zentner (100 kg)	Value in marks
1873	29,300	16,110,000
1880	63,632	21,657,000
1898	151,350	37,948,000
1902	166,756	44,092,000

The following data show how the value of the export is distributed over different countries; they have been compiled from the export statistics for 1901: Great Britain and Ireland 16,215,000 marks, British Australia 6,539,000 marks, Russia 4,731,000 marks, United States of America 3,286,000 marks, Holland 2,067,000 marks, Austrian Empire 1,506,000 marks, Switzerland 1,082,000 marks, British South Africa 1,062,000 marks, Belgium 1,032,000 marks, Italy 766,000 marks, Argentine Republic 743,000 marks, France 719,000 marks, Sweden 688,000 marks, Denmark 573,000 marks, Chili 567,000 marks, Norway 514,000 marks, Mexico 509,000 marks, British India 482,000 marks, Brazil 395,000 marks, Portugal 297,000 marks, Roumania 174,000 marks, British North America 159,000 marks, Uruguay 142,000 marks, The Dutch East Indies 128,000 marks, Peru 121,000 marks, Portorico and Cuba 114,000 marks, Egypt 111,000 marks, China 105,000 marks, Spain 96,000 marks, and Central America 45,000 marks.

The manufacture of musical instruments is more or less spread all over Germany, but in addition of this, some important centres have sprung up and become famous for certain branches of the industry which are carried on there.

The most important of these centres is the Vogtland in Saxony, the principal places being Markneukirchen and Klingenthal; an extensive domestic industry is carried on there, and a number of factories are also engaged in

the production of string and wind instruments, harmoniums, &c., which are exported by large local firms. The number of hands employed in this neighbourhood will hardly be overrated if estimated at 5,000.

According to the official census for 1895, the musical instrument industry in Germany comprised 6,745 establishments employing 29,272 operatives; this number, however, does not include the large number of carpenters and the commercial staff belonging to the industry, as they were classified under a different heading. The distribution of the establishments was as follows: Manufacture of pianos and organs 1,862 establishments with 15,921 persons employed; manufacture of violins 1,137 establishments with 1,782 persons employed; manufacture of harmoniums 1,649 establishments with 3,972 persons employed; manufacture of other musical instruments 2,097 establishments with 7,597 persons employed.

196 of the above works were fitted up with steam, 26 with hydraulic power, 89 with gas motors, 9 with benzine motors and 12 with electricity, making a total of 332 establishments employing motive power amounting to 3,544 H.P.

The Manufacture of Pianos.

The annual output, which amounts to 80,000 instruments, bears witness to the prosperous condition of this German industry.

In the 18th century the practical application of hammer mechanism was first made in Germany, and with this improvement piano-making was introduced from that country into France and England. During the following years a gradual development took place in German piano-making, and in the latter half of the 19th century, especially in the seventies, the industry took a sudden rise which has not yet attained its culminating point. In the beginning of 1903, there were 465 piano factories in Germany, 167 of which were situated in Berlin, 27 at Stuttgart, 21 at Dresden, 16 at Leipsic, 8 at Hamburg, 10 at Liegnitz, 9 at Zeitz, whilst the remainder were scattered all over Germany. More than half of their manufactures are exported to foreign countries. The following figures, which are based on Imperial statistics, furnish a proof of the rapid increase in exportation. The value of ready made pianos and piano parts exported was:

In	Meter-zentner (100 kg)	Value in marks
1880	36,288	7,982,000
1886	64,676	14,875,000
1890	79,863	18,369,000
1898	111,631	25,675,000
1902	123,247	28,963,000

The principal markets for German pianos according to the statistics of 1901 were: Great Britain: 12,995,000 marks, British Australia: 6,102,000 marks,

Russia: 2,007,000 marks, Holland: 1,502,000 marks, and the South American republics, South Africa, Belgium, Italy, and Scandinavia.

The success of German pianos is greatly due to the fact that they are comparatively cheap, and possess all the qualities required in a good piano. They are full and rich in tone, the construction is the most modern, and great attention is paid to the frames being made solid and durable, and they are fitted up with quiet elegance and good taste, as well as adapted to the individual markets.

The branch establishments for making the different mechanical parts of the piano have also increased. The most important of these special branches is the manufacture of piano mechanism which was represented by 30 establishments in 1903, counting amongst their number important factories in Berlin, Hamburg, Leipsic, and Stuttgart. Then follows the key-board manufacture with 50 establishments, whilst the manufacture and covering of hammers occupied about 25 somewhat smaller firms.

These special branches not only manufacture for the German piano industry, but do a large export trade with foreign countries.

Besides these, there are a great many other factories—in the year 1903 there were as many as 280—which are not classified under the head of musical instruments, though they manufacture the different parts belonging to the piano, such as: cast steel strings, wires, felt, plates, bronze, iron, and wooden parts of the piano, wooden carving, &c.

In wire strings and felt, Germany, besides supplying her own requirements, also carries on a large trade with foreign countries. The oldest and most important firm for making felt for pianos has its seat at Wurzen and Leipsic. Pivots and pins are principally made in Westphalia (Plettenberg, Neuenrade, Werdohl), candle-sticks, pedals and handles at Iserlohn, Dresden and Berlin; the decorative wooden parts of pianos, wood carving, &c. are chiefly supplied by Berlin and Zeitz.

The Manufacture of Organs and Harmoniums

has attained a high stage of perfection in Germany. A great many of the improvements in organ manufacture may be justly put down to German masters.

In the year 1903 there were 275 factories for the manufacture of church-organs, of which the greater number were small establishments working only for the home trade. There are however a considerable number of large and important factories which supply both the home and foreign markets. The pneumatic system has almost entirely superseded the old mechanical system.

The manufacture of harmoniums, which in the year 1903 was estimated to comprise 45 establishments, has risen considerably of late years. The American (sucking) system has a soft full tone, and produces altogether a more pleasing instrument than the old-fashioned one of former years. It is only natural that this has increased the manufacture, and a great many of the old and new factories which have taken it up are now doing a flourishing

business. Leipsic and its surrounding districts are the chief centres for this new industry for the manufacture of organs and harmoniums which successfully compete with those of American firms. Harmoniums built on the old (compressed) system, which are still appreciated by some connoisseurs, are chiefly constructed in South Germany.

The Manufacture of Mechanical Musical Instruments

which embraces all instruments constructed to emit sounds by means of pin rollers, perforated rollers or discs, is chiefly restricted to a few industrial districts or localities.

The chief seat of the manufacture of flute-organs and orchestrions for almost a century has been the Black Forest (Baden), and the various parts belonging to the instruments are manufactured at the towns of Freiburg, Villingen, Furtwangen, Vœhrenbach and Unterkirnach. The oldest and most important factory of this description is that of Messrs. M. Welte & Sons at Freiburg i. B., which besides carrying on a considerable export trade to America has a branch establishment at New York. Lately, however, the manufacture of such instruments has been undertaken at other places, such as Leipsic, Berlin, &c. In 1903 there were 45 such establishments in the Empire doing a good export trade especially with India and Russia.

The manufacture of barrel-organs with pipes and pin-rollers is chiefly carried on in Waldkirch in Baden (the oldest seat of this industry), Berlin, Zittau in Saxony and in one or two isolated factories. In 1903 Germany had 32 factories. Barrel-organs with a clarionet-stop and perforated music-sheets, so-called "hurdy-gurdies," are manufactured chiefly in large works at Leipsic, Gera (Reuss), and Berlin.

The branch which up to a few years ago was economically the most important, is the manufacture of mechanical organs fitted with a steel-comb and perforated disc, which was invented in Leipsic, and has retained its seat in that city.

These instruments are made in the shape of musical boxes, dime-in-the-slot apparatus, cupboards and clocks, in all sizes and at varying prices; during the course of the last few years, however, fewer have been sold, as the taste of the general public has been diverted to other manufactures, such as automatic speaking instruments (Grammophones, Phonographs) and orchestrions. The factories concerned have consequently been obliged either to decrease their output, or to turn their attention to new articles (automatic speaking instruments, piano-orchestrions, &c.). Above all however the home demand for orchestrion like instruments with pneumatic and perforated sheets of notes, especially for the so-called piano orchestrion (piano combined with orchestrion), has risen quite unexpectedly, since instruments with steel combs have become less popular lately. Electricity is chiefly used to work the above mentioned instruments, and they are generally fitted up as automatic and dime-in-the-slot machines.

Piano organs, the manufacture of which is chiefly carried on at Leipsic, Zittau, and in Berlin, may also be mentioned here, as their popularity has considerably increased of late.

During the course of the last two years the manufacture of mechanical piano playing apparatuses has been added to this branch, and as they most probably have every chance of success, several firms have occupied themselves in their production.

The Manufacture of Stringed Instruments and Strings

is spread all over Germany, and is chiefly carried on in small factories and in the homes of the workers. The productions of the old Italian school still serve as models for present manufacturers. The numerous attempts to alter the normal shape of the violin have never proved successful. The chief centres for the wholesale manufacture and export of stringed instruments are Markneukirchen in the Saxon Vogtland, and Mittenwald in Upper Bavaria. In Markneukirchen this industry is greatly fostered through the patronage of the Saxon Government, and a technical school, subsidised by the State, has been erected for learning the branch.

The manufacture of the different parts of the violin and other stringed instruments is chiefly carried on in the workers' own homes. Bows of various prices are made in Markneukirchen and its neighbouring districts, which have become famed for the high pitch of perfection they have attained.

For the manufacture of guitars, mandolines, zithers, banjos and such like instruments, Markneukirchen and its neighbourhood has almost a monopoly, although Klingenthal in Saxony, Johanngeorgenstadt in the Erz Mountains, and Dresden have started the manufacture of accordion zithers with great success. Concert zithers of the best kind are supplied by South Germany.

The manufacture of gut strings has risen considerably in Markneukirchen and its neighbouring districts.

The trade statistics of the year 1895 shew that the 90 factories in the Saxon Vogtland were able to supply half the demand of the international market, as well as the home one.

The Manufacture of Harmonicas

was carried on in Germany in the year 1903 by 135 large factories, without including the smaller ones. Klingenthal in the Saxon Vogtland, and its neighbouring districts is the great manufacturing seat for accordions and concertinas; then follow Gera (Reuss), Altenburg (Saxon-Altenburg), Berlin, Magdeburg, Leipsic, and other places with only single factories. 50 factories were also occupied in manufacturing different parts of harmonicas in 1903.

The only places of note where mouth harmonicas are made in great quantities are Klingenthal, its surrounding districts and Trossingen in Wurtemberg.

The Manufacture of Wind Instruments and Instruments of Percussion, &c., with their Appurtenances.

Brass and wooden wind instruments are made in great quantities by smaller factories all over Germany; in the Saxon Vogtland however a centre of this branch is formed by the places Markneukirchen, Klingenthal, Adorf and Schœneck. Single parts for metal wind instruments are also manufactured at Markneukirchen.

German wind instruments have become very popular, and have entirely overcome the former prejudice entertained against them.

Some firms produce excellent instruments, quite works of art in this line. In the year 1903 it was estimated that 170 establishments were employed in making brass wind instruments (including some very large factories), and 120 establishments with the manufacture of wood wind instruments; the workshops for repairing, of which there are several, are not included in this estimate.

Drums and other such instruments are manufactured by some very large firms in Markneukirchen, Berlin, Erfurt, Weissenfels, &c., and in the year 1903 there were 40 such establishments, generally in connection with vellum factories.

All the different parts of wind and stringed instruments (such as cases, boxes, mechanisms, mutes, rosin, &c.) are made in large quantities in the manufacturing districts of the Saxon Vogtland. Implements for tuning pianos and zithers are made in Stuttgart, Suhl and Mehlis in Thuringia. These last two places also do a large trade in metal music-stands and mounts of drums, in addition to their staple manufactures, such as tuning forks, triangles, chimes of bells, &c. Children's instruments (now no longer included in the export statistics of musical instruments) in the shape of toy harmonicas, trumpets, flageolets, fiddles, drums, &c., are made in enormous quantities in the vicinity of Klingenthal in Saxony; steel pianos, smaller peals of bells and other instruments are made in the Erz Mountain districts of Borstendorf, Eppendorf and Grünhainichen; musical boxes and dolls are made in Sonneberg in Thuringia; children's trumpets and jew's harps in Fürth and Nuremberg.

In bringing this article to a close, it is only necessary to add the Trade Unions Report on the statistics of the years 1891 and 1902 of the industry of musical instruments, which according to the regulations of the Trade Union only embraces genuine industrial establishments.

The Trade Union numbered in its 3 sections, Berlin, Leipsic and Stuttgart in 1891 a total of 824 factories employing 16,701 insured operatives, receiving 16,932,351 marks in wages, whilst the annual report for 1902 shows that there are 1,071 factories employing 24,930 able workmen and paying 27,946,858 marks in the industry. From the above statistics, which show a considerable increase in factories and operatives during the last eleven years, the statements made at the beginning of this article, that the production of musical instruments in Germany is in a constant stage of development, are both substantiated and proved.

Paul de Wit.

GERMAN CHEMICAL INDUSTRY.

The chemical industry is more than all other industries a creation of the 19th century. In former centuries the demand for all kinds of chemicals was very slight, being limited to a series of substances used as curatives which were prepared by apothecaries and doctors only to the required amount, and to several metallic oxides and mineral dyes, obtained partly as by-products in smelting establishments, and partly prepared according to ancient and troublesome receipts by those glass-makers and potters who required them. Such products as alum were prepared here and there on a somewhat more extensive scale for the trade, and signs are not lacking which indicate that alchemists, who were obliged to make most of the materials they used with their own hands, sold a part of their products.

On the other hand, the idea of a systematic manufacture of chemicals on a commercial scale first arose towards the end of the 18th century, coincident with the laying of the foundations of the chemical science of to-day. With the recognition of the many useful applications of such products as sulphuric acid, nitric acid, soda, &c., in all branches of trade, enterprising people were found ready to undertake the manufacture of these products on a large scale, first in England and France, and later in Germany. The results exceeded their fondest expectations, as almost about the same time the scientific progress made by older industries based on dyeing and printing, bleaching, soap and glass making, and ceramic arts, made the use of chemicals everywhere necessary. Chemical industry was soon established in Germany, where it was hailed by the large number of well trained apothecaries as a welcome enlargement of their former field of work, but only a limited market was found for the products as long as other industries remained stationary. The development of the German chemical industry to its present magnitude only took place after the decided transformation of Germany from an agricultural into an industrial state, the development of means of intercourse and the opening up of foreign markets. The chemical industry of Germany however

is indebted to the excellent training which its representatives were enabled to enjoy through the progress of scientific chemical investigation, for the reliable and rapid development of its foreign relations.

Correspondingly with this course of development the sequence in which the various branches of German chemical industry have grown has differed from that in other industrial countries. In England for example, the acid and alkali industries developed very soon to such an extent that it became necessary to look to foreign markets for the disposal of the greater part of the products, but in Germany these industries made such slow progress that for many years it was impossible to avoid the importation into Germany of such products as soda, bleaching powder and caustic soda. On the other hand the manufacture of superior kinds of chemicals and pharmaceutical preparations, undertaken in connection with the old apothecary establishments, soon increased in importance, as young investigators, fresh from the schools of such men as Liebig, Wöhler and Bunsen, sought in the chemical industry a field for the application of their scientific attainments. The dyeing industry, which originated in France in the second half of the 19th century, was taken up by England with much enthusiasm, but was however developed there only to a limited extent. In Germany, on the contrary, the most favourable conditions were found for its fullest ultimate development, and it soon grew to an unexpected magnitude in spite of the fact that for a long time it remained dependent on foreign countries for its necessary raw materials. The enormous needs of the dyeing industry for chemicals of all kinds, the continuous erection of entirely new chemical factories, the establishment and development of potash mining in Germany, the growing importance of the ammonio-soda process and the increasing use of electro-chemical methods of manufacture, all these and many other factors have served for the establishment of the German chemical industry, and at the beginning of the twentieth century, all branches enjoy the greatest prosperity and contribute mutually towards each others' success.

The following statements briefly show the present position of the most important branches of the chemical industry, and at the same time form a comment upon the achievements which have played especially prominent parts in the development of the several branches.

The acid and alkali industry, the sphere of activity of which was narrowly limited and definitely prescribed as long as it was restricted to the Leblanc soda process with its subordinate industries, has safely passed the crisis brought about by the introduction of the ammonio-soda process, and has been greatly elaborated. The Leblanc method has not been abandoned, but is used in the preparation of caustic soda and principally in preparing caustic potash from Stassfurt chloride of potassium. The hydrochloric acid obtained as a by-product in this process is indispensable for the dyeing industry. The enormous use of hydrochloric acid for the preparation of chloric and bleaching powder has steadily decreased, the final solution of the problem of electrolytic decomposition of alkali chlorides having opened up an

extremely abundant source of pure chlorine. Independently of these methods of work, the great abundance of salt in Germany is turned to account in the ammonio-soda process.

The sulphuric acid industry, the raw material for which is almost exclusively obtained from Spanish pyrites, is no longer limited to the troublesome lead chambers. Following the pioneering work of the greatest of German manufactories, the "Badische Anilin- und Sodafabrik" at Ludwigshaven-on-the-Rhine, several establishments now employ methods which produce sulphuric acid by the direct union of sulphurous acid with the oxygen of the atmosphere, by which method acid of any desired concentration can be prepared.

A large number of inorganic industries are closely connected with the acid and alkali industries. The manufacture of artificial fertilizers, the alumina, borax, baryta and strontia industries, the preparation of compressed and liquefied gases, cyanogen and chromium salts and the manufacture of sulphites and hyposulphites supplement and enlarge the operation of the old acid and soda manufacturies in various directions.

The manufacture of fine chemicals has long ceased to be a small industry. It had developed to an astounding extent both in the diversity and the quantity of its products. The large number of laboratories supported by public or private means, which are scattered all over the country, the amount of scientific work carried on in all chemical manufactories, the increasing needs of dye works, printing houses, paper factories and other industrial establishments which use various kinds of chemicals, and the marked expansion of photography—all these conduce to the creation of an ever increasing market for this branch of chemical industry.

The manufacture of fine chemicals includes amongst its innovations that of salts of rare earths. Only a few years ago these were almost unknown even to chemists, but to-day they are prepared on a large scale for the incandescent gas-lamp industry. The raw material for this new manufacture is mineral monazit, the Brazilian kind being almost exclusively used.

The production of the derivates of coal-tar, also called "tar distillation," could not reach any very great importance as long as it was confined to the tar produced in gas works, this quantity being necessarily small during the time previous to the general introduction of gas as a means of illumination in private houses. Ever since gas has been so generally introduced for lighting and heating, but chiefly since the coke factories in all the German coal districts have taken to recovering all their by-products, such a great quantity of tar has been produced that the factories for working it up have grown to enormous proportions.

The distillation of tar is carried further in Germany than is customary in England, for not only are the crude fractions of the tar prepared and made use of commercially, but also the pure hydrocarbons and phenols.

The transformation of these constituents of tar into direct raw materials for the dyeing industry (aniline, naphthylamine, naphthol, &c.) has developed

into a special branch of industry, which is carried on partly quite independently, partly in connection with great dyeing factories, but in every case completely isolated from the real manufacture of dyes.

As is well known, the manufacture of coal-tar dyes has developed to an exceptionally high degree in Germany, producing without doubt the greater part of the dyes used throughout the whole world. It requires chemists of the broadest and most thorough scientific training, and receives therefore the very greatest benefit from the extreme development of scientific chemical instruction in Germany. For the purpose of its further development, however, it is necessary to maintain extensive and expensive laboratories for further investigations in theoretical chemistry. As a matter of fact a great number of important scientific achievements have issued from the laboratories of dye works.

During the last two decades the number of new dyes introduced into the trade by the German manufacturers mounts up into the hundreds, of which only a few groups can be mentioned here.

The technical synthesis of alizarin, accomplished toward the end of the seventies, has led to the discovery of a whole group of dye stuffs, closely related to alizarin in their nature and method of use, and similarly characterized by great purity. These dye stuffs have become of great importance for the wool-dyeing industry. Still more extensive, more diversified and by far more numerous are the azo dye-stuffs, a certain subdivision of which, the so-called substituted azo dye-stuffs, has entirely revolutionized the dyeing of cotton goods by making the use of mordants entirely unnecessary. The group of triphenyl methane dye-stuffs, to which the oldest and first introduced aniline dyes belong, was considerably enriched during the eighties by a large number of new substances which can scarcely be excelled in brilliancy, lustre and shade. By far the greatest triumph of the dye stuff industry, however, is the technical synthesis of indigo, successfully accomplished towards the close of last century, after many years of experimenting, by the "Badische Anilin- und Sodafabrik." By this discovery costly indigo dye can be prepared from naphthalene, the cheapest constituent of coal tar, by a series of chemical transformations, and thus successful competition with native indigo is rendered possible.

The perfume industry has experienced a development similar to that of the dye stuffs. It began with the separation of the fragrant essences of numerous drugs, chiefly foreign. Very soon the investigation of ethereal oils began, and by means of the knowledge thus gained the preparation of these products was carried still further. Guided by the pioneering work of Tiemann on vanillin, many other syntheses of perfumes soon followed. These syntheses produced many new perfumes, substances not existing in nature, and also made it possible to prepare in the laboratory any desired quantity of perfumes, which in nature occur in only very limited quantities. The most brilliant triumph of this extensive scientific work has been the artificial production of jonon, the pure perfume of the violet. Very important results

have also been obtained of late years from the artificial composition of the so-called complex scents (Jessamine, and ylang-ylang oils).

The perfume, soap and food-stuff industries have derived great benefit from these achievements, and have reached far greater success by their help than they would otherwise have done.

The industry of pharmaceutical preparations likewise began with the separation of curative substances from imported drugs, but later replaced these native products, so inconstant in their constituents and effectiveness, by others whose purity and uniformity enabled the physician to place greater reliance in them. This was specially important in the cases of those drugs whose healing power depended on their containing extremely active alkaloids, for example, opium, quinine, and the fruit of the strycknos species. But in the beginning of the eighties, the investigation of the physiological action of many coal-tar derivatives was undertaken, and these were soon utilized. At the present time we possess a large and daily increasing number of synthetically prepared curatives, many of which, for example antipyrin, phenacetin, guajacol, &c., are absolutely indispensable to the physician. Under this head come also the great number of antiseptics, used not so much for external purposes as for fighting bacteria, the menacing invisible enemies of mankind. It would almost seem that the number of achievements in this field has been excessive.

Most recently this industry has directed its efforts towards the production of luxuries and easily digested food-stuffs. Saccharine, the extreme sweetness of which enables us to sweeten our food without overloading the digestive organs with sugar, is a blessing for many sick persons. Among the great number of soluble albumens recently put on the market, some will certainly be found whose value stand the exhaustive test of time.

The problem of the artificial production of food-stuffs, considered on many sides as the highest aim of technical chemistry, has not yet been fully solved. Numerous interesting experiments which bid fair to succeed have been made in this domain; the veil is gradually being withdrawn which seemed to prevent reseach into the finer chemical structure of those substances which form the chief constituents of our food-stuffs.

The active life, so strongly exhibited in all of the above mentioned chief branches of chemical industry, is reflected also in the smaller special departments which cannot be detailed here. We cannot conclude these considerations, however, without alluding to the valuable help given to the entire chemical activity of Germany by the multiplicity and completeness of those industries devoted to the preparation and sale of chemical apparatus and instruments. There are factories in Germany capable of making any desired chemical apparatus quickly, intelligently, and practically. Great machine factories are working exclusively for the needs of the chemical industry, and prepare the boilers, valves and digesters which are required in such great numbers. Others are engaged in the production of stoneware of immense size and capable of great resistance to fire. Others again are ready to manufacture

apparatus of platinum, nickel, lead or other resisting material, however complicated the constantly changing designs may be. And another extensive industry, in which a marked division of labour is conspicuous, is engaged in the skillful preparation of the numerous glass, metal, rubber and porcelain objects which form a part of the equipment of every well arranged laboratory. There is no doubt that the accessibility and cheapness of chemical utensils has contributed in a marked degree to the brilliant development of scientific and technical chemistry.

The economical importance of chemical work in Germany is best illustrated by the statistics which follow:

The number of workmen employed in the chemical industry and the wages paid are given in the reports of the trade association. These latter are divided into eight sections, embracing the whole of the German Empire, and are classified according to their chief centres. The number of establishments in each section, workmen employed, and the wages paid during 1898 are shown in the following table:

Sections	Number of establishments	Number of workmen constantly employed	Wages paid marks
I. Berlin	1,334	20,380	20,150,505
II. Breslau	718	8,815	6,796,806
III. Hamburg	1,059	26,313	27,700,358
IV. Cologne	1,141	28,130	30,785,279
V. Leipsic	1,345	25,920	24,976,916
VI. Mannheim . . .	693	24,535	25,541,828
VII. Frankfort	527	18,218	21,800,601
VIII. Nuremberg . . .	722	8,530	6,455,327
	7,539	160,841	164,207,620

The gradual increase in the number of establishments, workmen, total amount of wages and average wage is shown by the following:

Year	Number of establishments	Number of workmen	Total wages marks	Average yearly wage marks
1894	5,758	110,348	98,621,506	855
1895	5,947	114,581	103,466,498	894
1896	6,144	124,219	113,727,679	916
1897	6,316	129,827	120,912,418	922
1898	6,589	135,350	129,638,202	948
1899	6,911	143,119	139,569,030	965·72

Year	Number of establishments	Number of workmen	Total wages marks	Average yearly wage marks
1900	7,169	153,011	154,921,710	1,002·87
1901	7,352	156,488	159,930,488	1,011·10
1902	7,539	160,841	164,207,620	1,009·67

In 1898 the chemical industry paid 1,279,645 marks to its workmen in accident indemnities.

The total value of all the products of the German chemical industry in 1897 was, according to the statistics of the Imperial Bureau of the Interior, 947,902,570 marks, and since then it must have increased to over a milliard.

The quantities and values of the products of the single branches of chemical industry are not published. They are known however for several fundamental products, such for example as the production in tons and the value of: Sodium chloride in 1888 496,400 tons and 10,663,000 marks, 1893 504,700 tons and 13,977,000 marks, 1897 543,300 tons and 12,137,000 marks, 1901 578,800 tons and 15,730,000 marks; Potassium chloride in 1888 142,700 tons and 18,360,000 marks, 1893 137,200 tons and 17,305,000 marks, 1897 168,000 tons and 23,058,000 marks, 1901 294,700 tons and 35,129,000 marks; Sulphuric acid in 1888 398,800 tons and 13,473,000 marks, 1893 522,800 tons and 15,763,000 marks, 1897 623,100 tons and 14,958,000 marks, 1901 856,800 tons and 24,448,000 marks.

The value of the foreign exportation of German chemical products was in 1889: 226·7, in 1894: 268·9, in 1898: 339·2 and in 1902: 386·0 million marks.

The import statistics for the same years, namely 106·6, 106·9, 104·6 and 111·2 million marks stand in striking contrast to the above figures.

Otto N. Witt.

ENGINEERING.

A. The Production of the most important Building materials.

Iron and Cement.

Anyone wishing to gain a clear conception of the development of engineering in Germany during the last decades, need only cast a glance at the ever increasing quantities of the two chief building materials produced there: iron and cement.

1. Iron. In the German blast furnace works the development in the produce of pig iron has been as follows:

1884	3,600,612	tons	1891	4,641,217	tons	1898	7,316,766	tons
1885	3,687,434	-	1892	4,937,461	-	1899	8,143,132	-
1886	3,528,658	-	1893	4,953,148	-	1900	8,422,842	-
1887	4,023,953	-	1894	5,559,322	-	1901	7,785,887	-
1888	4,337,421	-	1895	5,788,798	-	1902	8,402,660	-
1889	4,524,558	-	1896	6,360,982	-			
1890	4,658,451	-	1897	6,889,067	-			

The manufacture of pig iron has therefore more than doubled itself in the last eighteen years.

The produce, for instance, of the German blast furnaces in March 1903 was: Puddle pig iron 76,361 tons, Bessemer pig iron 34,905 tons, Thomas ingot iron 510,563 tons, Foundry pig iron 153,910 tons, Specular cast iron, &c. 67,485 tons, total 843,224 tons.

The produce of basic ingot iron in Germany has increased as follows:

Year	In the converter	In the Siemens-Martin furnace	Steel-cast-iron	Total
1894	2,342,161 tons	899,111 tons		3,241,272 tons
1895	2,520,396 -	1,018,807 -		3,539,203 -
1896	3,004,615 -	1,292,832 -		4,297,447 -
1897	3,234,214 -	1,304,423 -		3,538,637 -
1898	3,606,737 -	1,459,159 -		5,065,896 -
1899	2,973,225 -	1,693,825 -		5,667,050 -
1900	4,364,650 -	2,145,565 -	135,654 tons	6,645,869 -
1901	4,274,886 -	2,012,126 -	107,210 -	6,394,222 -
1902	5,229,939 -	2,434,219 -	116,524 -	7,780,682 -

We can say therefore that the produce of ingot iron has doubled itself in the short period of six years.

2. Cement. The produce of Portland cement in Germany can be seen from the following figures:

Year	Number of factories	Manufactured casks (170 kg)	Year	Number of factories	Manufactured casks (170 kg)
1877	29	2,400,000	1892	62	10,550,000
1882	32	3,050,000	1893	62	11,350,000
1883	34	4,000,000	1894	60	11,500,000
1884	37	4,700,000	1895	63	12,400,000
1885	42	5,000,000	1896	63	13,150,000
1886	42	5,700,000	1897	66	14,700,000
1887	45	7,500,000	1898	83	17,000,000
1888	52	7,950,000	1899	86	20,000,000
1889	60	8,800,000	1900	—	23,000,000
1890	60	9,150,000	1901	—	24,000,000
1891	60	9,950,000	1902	95	23,000,000

Within twenty-five years the number of factories has more than trebled itself and the amount produced has increased tenfold, while within the last decade the manufacture of cement in Germany has doubled.

These facts respecting the multiplication of the manufacture of wrought iron and Portland cement during the last few years, sufficiently testify to the enormous development of engineering in Germany.

B. Building.

1. Iron bridges. The progress made in the art of bridge building is directly due to the tremendous development of traffic. Traffic knows no bounds: it is ever demanding the solution of greater problems, no matter whether the river

mouths or valleys be so broad or so deep as to exclude all possibility of setting up firm scaffolding for the required erection. On the other hand, in cases, for instance, of ship canals or large railways, traffic is always demanding more and more space and will not brook any limitation, either by means of piles or pillars, of its free development.

Now the favourable formation of the land in Germany has allowed of the narrowing of the network of traffic without making at the outset specially great demands on space. In the building of their bridges, the Germans were therefore in the happy position, up to the beginning of the last decade, of being able to occupy themselves with executing minor tasks, thus perfecting themselves so thoroughly in the theoretical and constructive formation of bridge girders as to have, in many respects, taught other nations useful lessons in their greater tasks. Ritter, Culmann, Schwedler, Gerber, Winkler, Mohr, Müller-Breslau, and many other theorists young and old found out the proper manner of making statistical calculations for even the largest spans, and these calculations have been proved by experience to be correct. Endeavours have also been made of late years to build everything in artistic form that, owing to the requirement of the most favourable distribution of material and cheapest method of execution, is necessarily simple in shape and outline.

Side by side with this development, that of the production of iron has kept pace. Commencing with cast iron, which greatly limited the span and only obtained a temporary importance at the very outset, continuing with wrought iron, now used exclusively for bridge building, and finally ending with the manufacture of nickel-steel and steel cable, which promise even in their infancy to play a part in the future of bridge building. The testing of material has become important as a pioneer in the science of gauging the strength of individual portions of bridges. This too has in the last fifty years become a special science, the names of Bauschinger and Bach being prominent above all others. As early as in 1854 fairly large rods, such as are actually used, were torn to pieces at Munich and thereby the knowledge of the tenacity of iron and its laws was so completed as to be able to be made the groundwork of calculations. Wöhler found out that especially the difference in tension called forth by varying strain was determined by the disturbance of the cohesion of material, so that now-a-days the strain admissible is regulated according to the relation of live load to dead load, and to the manner and duration of the live load. Great attention is also being paid in Germany to the perfection of cross section. Special value is attached to a practical distribution of material round the lines of stress with an exact centric junction of the individual rods in the points of junction, to a suitable execution of the impacts, and other details, as for instance, a proper arrangement of rivets at the joints so as to avoid all side tension. While in the fifties building was still done by the superficial stay, which in consequence of the inflection of the girders pressed the edges of the walls on one side, we find the tangential stay introduced as early as 1854, the principle of which is now-a-days in use everywhere recognised as correct; the bolt stay intro-

duced later on, is only a secondary form of this principle. To meet the expansion and contraction of bridge girders caused by changes in temperature, the pendulum and roller bearings have come into use in Germany, and they have been improved in later years in the case of broader bridges by the use of longitudinal rollers on transverse ones, or by the placing of rollers slantwise on account of the transverse expansion. These German constructions are being more and more introduced. The bolt connection of all the rods meeting in one point of junction, so as to give a jointlike effect to the connection, has never been thought much of, more use being made of carefully thought out and less expensive riveting which has proved safer and more capable of resistance in cases of accident. In more recent days, on the other hand, in cases of broad span bridges jointlike over-lappings of cross girders have been introduced in Germany, so as to avoid the very considerable additional tension caused by firm riveting. In fact the Germans have been incessantly studying and improving every detail not only of building, but also of the calculations necessary thereto. Special and systematic attention has been paid to the examination of the influence exerted by a single load on the individual parts of the bridge over which it is passing. These methods are so improved that now-a-days any scientifically trained and experienced constructor will succeed, without meeting insuperable difficulties, in accurately determining by means of calculations and with the help of "lines of influence" the most unfavourable distribution of load for every possible system of girder, and thus be able to calculate exactly the highest possible demands that will be made within the range of practical requirements on any portion of the structure under consideration. With the help of the representation of elastic and other changes of shape in the individual portions of "statically indefinite" girder-shapes, which often also meet higher æsthetic demands, the play of forces can always be followed from their point of application to their disappearance in the ground. After Germany had become financially stronger, her engineers were therefore easily able to solve the greatest problems in building with skill, gained by thorough schooling in theoretical learning and practical knowledge. This is best demonstrated by a list of all the iron bridges of over 70 metres span, from which it will be seen that before 1890 only fifteen were in existance, although before this date most of the railroad building had been completed. Since 1890 no less than twentytwo iron bridges of over 70 metres span have been erected.

Old Iron Bridges. Before 1890.

No.	Date	Name, locality of bridge, and girder system	Builder or designer	Openings:	
				Number	Width metres
1.	1850–1857	Railway bridge over the Vistula. Parallel girders with trellis-work	Lentze	6	121

No.	Date	Name, locality of bridge, and girder system	Builder or designer	Openings: Number	Openings: Width metres
2.	1850–1857	Railway bridge over the Nogat at Marienburg. Parallel girder with trelliswork	Lentze	2	98
3.	1855	Railway bridge over the Rhine near Cologne. Parallel girder with trelliswork	Lohse	4	98
4.	1860–1862	Railway bridge over the Rhine near Mayence. Pauli girder with square-framed work	Pauli. Gerber. Werder	4	105
5.	1862	Railway bridge over the Rhine near Coblentz. Arched railway bridge	Hartwich	3	97
6.	1865–1867	Railway bridge over the Rhine near Mannheim	Benkiser	3	90
7.	1863–1864	Railway bridge over the Rhine near Griethausen	Hartwich	1	100
8.	1868–1870	Railway bridge over the Elbe near Hamburg. Lohse girder	Lohse	3	96·35
9.	1868–1870	Railway bridge over the Elbe near Harburg	Lohse	4	96·35
10.	1869	Foot bridge over the Main at Frankfort	Schmick	1 2	79·69 39·56
11.	1873–1875	Railway bridge over the Vistula near Thorn. Half parabolic girder	Schwedler	5	94
12.	1876–1879	Railway bridge over the Rhine near Coblentz. Arched bridge	Hilf. Aktenloh. Dörenberger.	2	106
13.	1880	Road bridge over the Saale near Calbe	"Gutehoffnungshütte"	1	104
14.	1883–1884	Road bridge over the Rhine near Mayence	Lauter	5	102
15.	1884–1887	Road bridge over the Elbe near Hamburg	A. Meyer. Gleim. Engels	3	101
		More Modern Iron Bridges. Since 1890.			
		A. Arched Girders.			
1.	1888–1890	Railway bridge over the Nogat near Marienburg	Schwedler. Mehrtens	2	103·2
2.	1888–1891	Railway bridge over the Vistula near Dirschau	Schwedler. Mehrtens	6	129

No.	Date	Name, locality of bridge, and girder system	Builder or designer	Openings: Number	Openings: Width metres
3.	1889–1890	Road bridge over the Neckar near Mannheim. Gerber girders. Suspension form	Gerber and Rieppel	1 2	74·70 56·15
4.	1890–1893	Railway bridge over the North Elbe near Hamburg. Lohse girder	Lohse's system ("Gutehoffnungshütte")	3	101
5.	1891–1893	Railway bridge over the Vistula near Fordon. Semi parabolic girder	Mehrtens (Harkort, "Gutehoffnungshütte")	5 15	98·5 61·12
6.	1893–1895	Railway bridge over the Rhine near Roppenheim. Semiparabolic and parallel girder	General Imperial Railway board	3 4	92·0 31·05
7.	1898	Imperial footway over the Upper Spree near Berlin. Outrigger girder with middle joint, hanging supergirdle, and rising arch	Müller-Breslau	1 2	86·0 43·0
8.	1903	Railway bridge, single track, over the Havel near Brandenburg. Semi parabolic girders and half diagonals	Bernhard	1	90·0
9.	1903–1904	Road bridge over the Ring Railway near Berlin. Gerber girders	Hedde	1 2	108·0 60·0
		B. Arched Bridges.			
1.	1891–1892	Road and railway bridges over the Emperor William Canal near Gruenenthal: Lunar shaped, double jointed square-framed arches	Greve	1	156·5
2.	1892–1893	Road and railway bridge over the Emperor William Canal near Levensau. Double jointed square-framed arches	Lauter. "Gutehoffnungshütte"	1	163·4
3.	1893–1897	Railway bridge over the Wupper valley near Müngsten (Emperor William Canal). Jointless square-framed parallel girder with pillar	Rieppel	1	170
4.	1895–1896	Road bridge over the Danube near Straubing. Double-jointed square-framed arch	Rieppel	1	91

No.	Date	Name, locality of bridge, and girder system	Builder or designer	Openings: Number	Openings: Width metres
5.	1897–1899	Road bridge over the Rhine near Bonn. Double-jointed square-framed arch	Krohn	1 2 1	187·2 93·6 32·5
6.	1897–1898	Road bridge over the Rhine near Düsseldorf. Double-jointed square-framed arch	Krohn	2 1 1	181·25 60·36 63·36
7.	1897–1899			1 1	57·02 50·64
		Road bridge over the Rhine near Worms. Lunar shaped double-jointed square-framed arch	Rieppel	1 2	105·6 94·4
8.	1897–1899	Road bridge over the South Elbe near Harburg. Square-framed arches with tires	Rieppel and Gleim	4 6	109·1 31·15
9.	1898–1900	Railway bridge over the Rhine at Worms. Square-framed arch with tires	Seiffert and Barckhaus. Harkort	2 1 17	102·2 116·8 34·5
10.	1901–1903	Road bridge over the Elbe at Magdeburg. Square-framed arch	Union Dortmund. Holzmann	1	135
11.	1903–1904	Road bridge over the Spree near Berlin. Through girders with centre arch	Bernhard	1 2 1	78 37·5 6·0
		C. Suspension-Bridges.			
1.	1891–1893	Road bridge over the Elbe near Loschwitz. Braced suspension-bridge	Köpke	1 2	146·68 61·76
2.	1897–1898	Road bridge over the Argen near Langenargen. Braced cable-bridge	Leibbrand and Kübler	—	72

□ 2. Arched bridges. The progress made in the building of iron bridges goes hand in hand with that of arched bridges. The cost of keeping the latter in repair being less and the æsthetic form being pleasing, the public generally prefer them to all others. The progress in this kind of bridge has been very marked in the last decade, and is due chiefly to the great advance in the theory of their structure and to the careful examination and testing of the materials used, which latter fact has also caused a great improvement in the quality of the mortar. The study of the theory of vaults has thrown much light on the theory of arches. The introduction by Köpke of Dresden of joints in the crown and abutments of arched bridges, has rendered

it possible to build bridges of larger span. Concrete has successfully taken the place of stone set in mortar; iron too, of different thicknesses is used for strengthening purposes, thus rendering it possible to form extremely light and bold arches.

Lately fairly large stone bridges of more than 20 metres have been built in Germany, as the following list shows.

Date of building	Name and locality of bridge	Openings: Number	Openings: Width metres	Breadth metres	Material	Designer and builder
	1. Arches of Masonry.					
	Road bridges over the Murg:					
1886	near Hesselbach	1	30·4	3·9	Quarry-stone	Rheinhard
1888	near Ilgenbach	1	21·5	3·9		
1889	near Hutzenbach	1	33·5	3·9		
1890	Railway bridge over the Maine		25·336			Leibbrand
1891–1892	Railway bridge over the Maine near Kitzingen	6	36·532	4·2		Hoffmann
1884–1889	Emperor William Bridge in Berlin	1 2	22·2 8·2	26	Granite	Hobrecht and Pinkenburg
1884–1887	Flood bridge of road bridge over the Elbe at Hamburg	4	21·30		Clinker	Gleim and Engels
1894–1895	Valley of the Wertach near Nesselwang	6	up to 27·50		Quarry-stone Masonry	
1889–1891	Hercules bridge in Berlin	1	23·36	27·50	Clinker	Hobrecht and Faensen
1895–1896	Oberbaum bridge in Berlin, Road bridge and overhead line	7	up to 22	27·60	Clinker	Hobrecht and Bernhard
1892–1895	Road bridge over the Oder at Frankfort	8	27·6 30	13	Clinker	Lauter
	2. Arches of Masonry with Abutments.					
1885	Enz bridge near Hœfen	1	28		Free-stone	Leibbrand
1887	Murr bridge near Marbach	1	32·0	6·2		
1898	Murg bridge near Baiersbronn	1	33·0	6·6		
1890	Forbach bridge near Baiersbronn	1	25·0	6·6		

Date of building	Name and locality of bridge	Openings: Number	Openings: Width metres	Breadth metres	Material	Designer and builder
	3. Cement Arches and with Abutments.					
1888	Road bridge over the Werbach near Erbach	1	29		Iron	Leibbrand
1893	Road bridge over the Danube	1	50	8	Iron	
1894	Road bridge over the Danube near Munderkingen	2	22	4·1	Lead	
1895	Bridge over the Neckar near Muehlheim					
1895	Bridge over the Lein near Gemuend	1	23·1	5·6	Lead	
1895	Bridge over the Neckar near Gemmrigheim	4	38	5·5	Lead	
1896	Road bridge over the Danube	2	23·0		Lead	Braun
1895	Road bridge over the Danube near Inzigkofen	1	43·0	3·8	Iron	Leibbrand
1894	Railway bridge over the Elbe near Dresden	1 5	15·6 31·35		Stone	Köpke
1901	Road bridge over the Isar at Munich	1	64	18	Steel	Sager and Wörner
	4. Bridges.					
1893	Road bridge over the Saale near Ziegenrueck	1 1 1	13·6 30·0 12			Könen
1894	Road bridge over the Saale near Walsburg	1 1 1	18 29 12			
	5. Cement Arches without Abutments. Quarrystone Cement.					
	Rega bridge near Plathe	2	20·5			Liebold
	Zschopau bridge near Waldheim	2	22·5			
	Persante bridge near Cœrlin	3	22·67			
	Saal bridge at Saalfeld	3	25·85			
	Lippe bridge near Haltern	3	30			

Iron superstructures, ceilings and roofs. The introduction of iron constructions in overhead building has made corresponding progress to that of the development of iron bridges. Attempts to minimize the dangers attendant on iron constructions in cases of fire have been made in great number, and the results have contributed more and more to the forming of regular rules, among the most important of which seems to be the surrounding of the supports and girders with fireproof material. The increasing recognition of the transmission of tensile strain by the laying of iron in masonry built in cement, a body which can of itself essentially only bear compression stress, has resulted in a large number of lighter, stronger and better fireproof roofings being used of late years in place of wooden beams and arches.

The most popular kind of roofings are those of indented bricks with strap iron bands (Kleine's system), and concrete with round iron cores (Könen). It is in the construction of roofs that iron has come most into use. In the case of large halls and domed roofs, as in the building of bridges, compensation and safety are mostly due to the progress of the theory that enables one to build useful constructions on the basis of exact calculations for every form and shape.

The introduction of arched roofs with and without joints, as well as without ties, in order to compensate the lateral pressure, is especially worthy of mention. This kind of bridge allows the iron construction to be displayed because of their pleasing architectural shape. The following are some of the most noteworthy halls of modern days in Germany:

	Length metres	Breadth metres
Large hall in the Reichstag, Berlin . . .	28·0	22·0
Philharmony Concert hall, Berlin	35·20	25·10
Wintergarten, Berlin	74·75	22·26
Friedrichshain brewery, Berlin.	43·26	25·26
Bremen, Exchange	37·0	34·0
Frankfort-on-the-Main, Palmhouse . . .	54·0	32·0
Frankfort-on-the-Main, Exchange	38·82	28·26
Hamburg, Concordia	50·5	25·0
Carlsruhe, Festival hall	60·0	29·0
Mayence, Townhall	52·8	27·6
Berlin-Rixdorf Gasworks	44·0	36·0
Berlin, Cathedral cupola	35·65 metres diameter	

The last named cupola, constructed by Müller-Breslau 1897/1898, is especially interesting, as it measures from the circumference at the base to the top of the cross nearly 60 metres.

The following are the chief measurements of the large railway stations in Germany:

	Length metres	Breadth metres
Schlesischer terminus, Berlin	207·28	37·7
Anhalter terminus, Berlin	167·8	60·7
Bremen	131·0	59·3
Frankfort-on-the-Main, three halls, each	188·0	56·0
Cologne, central hall.	255·0	65·0
Mayence	300·0	42·4
Hamburg, central hall	175·0	73·0

C. Hydraulic Engineering.

Experience plays a greater part in hydraulics than in any other branch of engineering.

It is by the lessons learnt from such experience and the benefits obtained therefrom through the medium of literature, congresses, and meetings, by the reports of the technical representatives at the different German embassies, and by their scientific examination and confirmation, that the theoretical foundation of hydraulics has been laid. The execution of the ideas lies in the hands of state administration, or large communities, or even of capable contractors, the number of which has considerably grown of late, a fact which has greatly conduced to the advance of economical science. The ever increasing demands of traffic supply the incitement for new undertakings and new problems, and proportionate thereto is the progress made in other directions in technics, especially in that of the manufacture of machinery, causing the continual perfecting of implements and machines, which in their turn render it possible to work cheaper and faster than before, and incite people to fresh enterprises.

Excavating and dredging, both on dry ground as well as under water, has made great progress in Germany, and has resulted in the improvement of the suction-dredger. This is shown by the fact that the cost of dredging has been reduced by a tenth, and amounts under favourable circumstances now-a-days in Germany to not more than 0·16 marks per cubic meter, while the working capacity of large dredgers has risen to several thousand cubic meters per hour.

1. The regulation of rivers. The object of all work connected with the regulation of rivers is to render them navigable to the greatest extent, and to facilitate the outlet of their flushwater. By the aid of groins and parallel works, of fascines and ballasting, and many other means, the river profile is uniformly regulated and definitely limited so that it is exactly filled by moderate quantities of water. These works can be regarded as complete in nearly all German rivers. On the other hand those for the regulation of the ebb and flood are as yet incomplete. The first steps are now being taken, after exhaustive and extensive preparations, towards the retaining of the high water of the Oder in the hills, in dams, in order to obviate sudden danger and to lax up supplies of water for times of drought.

A splendid achievement in the masonry line was completed in 1890–1895, viz. the cutting of the mouth of the Weichsel, 7·1 kms in length, for the better abduction of drifting ice and high water.

2. River canalisations. Great progress has been made in the navigability of rivers by the formation of movable weirs, the object of which is to dam up small quantities of water, which can be crossed by locks with chambers. This plan was first adopted in the sixties in the case of the Saar, and was then followed in the Brahe, Spree, Main, upper Oder, Fulda, Ems and Mosel, which are now navigable for ships of from 300 to 400 tons burden.

3. Improvements in river mouths. Rivers opening out into the Baltic, which do not suffer from floods, have as a rule delta mouths.

Here most of the rivers are peculiar in that they do not flow direct into the sea, but first enter so-called "haffs" which are connected with the sea by narrow canals. As these "haffs" become silted up, the chief task is to keep them free. Moles are necessary, 300–800 metres long, to keep the mouths of the canals the right depth, and maintain the strength of the outflowing water in spite of the sand deposited by the coast currents. The mouth of the Oder is kept navigable as far as Stettin for ships of 7 metres draught, that of the Pregel as far as Kœnigsberg has a depth of 6·5 metres, that of the Nogat up to Danzig 7 metres, whilst Luebeck is about to deepen the mouth of the Trave to 8 metres right up to the town harbour.

The rivers which flow into the North sea form a flood funnel. In consequence of the entrance of the high tide into this funnel, the actual flood water is dammed up, and at ebbtide carries out the silt into the sea, gradually heaping it up at the mouth in such a manner as to become a hindrance to shipping. Quite a considerable work is being carried out for the improvement of the mouths of the Weser and Elbe. The funnels at the mouth are altered in such a way as to increase the amount of flood water which enters.

Especially noteworthy are the works constructed by Franzius at the mouth of the Weser, which were begun in 1887 and ended in 1893, by which the navigable depth for ships was increased as far as Bremen, to 6·3 metres.

4. Marine and inland shipping canals. Great activity is now prevailing in Germany in the direction of ship canals in the interior. Between 1890 and 1898 the most important canal constructed was that between Dortmund and Ems, which cost a round sum of 75 million marks, and is 2·5 metres deep and 18 metres broad at the bottom. It is 248 kms long, and contains besides 21 sluices, the celebrated shiplifter near Henrichenburg, an iron trough-sluice built by Mr. Gerdau of the firm of Messrs. Haniel & Lueg, under the direction of Offermann, which can be raised and lowered 14 metres by means of 5 floats 14 metres high. Further, we must mention the Elbe-Trave canal constructed by Rheder and completed in 1899, which is 67 kms long, 2·50 metres deep and 22 metres broad at the bottom. It contains 7 sluices with exceptionally convenient arrangements for traffic constructed by Messrs. Hotopp.

The Teltow canal was begun in 1901, and its most important sections have already been completed. It is 37 kms in length, 20 metres wide at its

bottom, and has a depth of 2·5 metres in the centre. It has been constructed for ships up to 600 tons burden, and is fitted up with electrical towing arrangements. Although it possesses only one lock with a fall of three metres, it serves to avoid and shorten the waterways leading through Berlin. Messrs. Havestadt and Contag were the contractors who executed the work.

The Rhine-Elbe canal, of which the Dortmund-Ems canal is a part, and which is destined for the same cross-sectional measurements, is nearing completion. The means have been granted for the Dortmund-Rhine canal 39·5 kms long and the central canal from Bevergen, a point on the Dortmund-Ems canal, to Heinrichenberg on the Elbe 325 kms long, with which the canal system of the Weser from Bremen to Hameln and a number of cross canals are connected.

The marine ship canal—"Emperor William canal"—between the North and Baltic sea, completed in 1894 by Bänsch, is 100 kms long and 8·5 metres deep, and is provided with two end sluices; it costs 150 million marks.

It takes twelve hours to pass through the canal. In 1901 the tonnage which passed through amounted to 4,285,000 registered tons, and the receipts to 2,113,000 marks. The Kœnigsberg Saalcanal was constructed between 1890 and 1901, and is 40·5 kms long, 30 metres in width at the bottom and 6·5 metres in depth. The cost of construction was 12,300,000 marks. Three hours are required to pass through the canal, and 1,210,000 registered tons of shipping passed through it in 1902, paying 221,500 marks in dues.

5. Harbour constructions. German seaports are situated for the most part at the mouths of rivers, in order to render direct communication possible between river vessels and sea ships; they mostly possess outer harbours for ships of larger dimensions to disembark their passengers, and relieve the sea ships wishing to proceed with a portion of their freight to the chief harbours. Thus Bremerhaven has been built at the mouth of the Weser in course of time for Bremen, and Cuxhaven at the mouth of the Elbe for Hamburg. In both harbours there are docks, in which the large American fast steamers can moor directly at the side of the wharfs. Similar conditions have developed in smaller harbours: for instance there is an outer port at Travemünde for Lübeck, at Warnemünde for Rostock, at Swinemünde for Stettin, at Neufahrwasser for Danzig, and at Pillau for Kœnigsberg.

The chief harbours of Bremen and Hamburg have undergone very great changes during the last few years, having been converted, increased and fitted out by Messrs. Franzius and Nehls into "Freihäfen" (free ports) in 1885–1890. At Lübeck and Stettin similar seaports have been constructed and furnished with every modern method of facilitation for traffic, although on a much smaller scale.

The inland harbours also, with their increasing traffic and ever rising importance for inland shipping traffic, have developed, in the free competition of individual centres of trade and industry, into model and well appointed centres of commerce. Of special importance in this respect are Cologne, Mayence, Mannheim, Frankfort-on-the-Main, Duisburg, Düsseldorf, Ruhrort, Dortmund, Dresden, Strassburg and Magdeburg.

The following tables will show the importance of such navigation works for goods traffic, and how they are being turned to account to an increasing extent.

I. German inland harbours.

	Goods traffic in tons in					
	1880	1890	1896	1898	1900	1902
Mannheim	1,073,469	2,683,150	4,182,482	4,508,271	5,885,000	5,729,574
Ludwigshaven	239,658	815,500	1,093,597	1,324,497	1,777,000	1,623,621
Cologne	214,367	523,600	—	895,427	874,000	800,786
Dusseldorf	131,412	241,011	—	600,036	620,000	661,374
Duisburg	—	2,728,618	4,092,096	5,596,971	6,493,809	6,6 21,698
Ruhrort	1,610,664	3,446,413	5,592,221	5,791,296	6,701,000	—
	1884	1887				
Frankfort-on-the-Main	152,425	360,062	1,024,161	—	1,112,030	1,034,033
	1880	1885	1890	1896		
Dresden	212,900	479,272	623,259	767,382	—	—
Magdeburg	1,031,071	1,091,983	1,559,742	1,764,932	1,994,717	—
	1870	1880		1898		
Berlin (without suburbs)	2,365,015	4,280,271	5,404,104	5,632,398	5,455,539	5,953,908
	1880	1890	1895			
Breslau	125,355	1,219,849	1,409,731	2,018,857	—	—

II. German sea ports.

	Goods traffic in tons in					
	1875	1880	1885	1890	1895	1898
Kœnigsberg	785,637	648,957	936,952	899,573	1,064,128	1,171,117
Danzig	821,788	926,349	1,018,113	939,932	1,195,148	1,442,231
Luebeck	825,525	1,065,405	1,137,661	1,482,464	1,517,878	1,762,303
Stettin	—	1,338,874	1,555,097	2,042,937	2,431,027	3,178,717
Bremen	1,040,179	1,597,459	1,599,120	2,265,388	2,968,746	3,624,388
Hamburg	2,720,966	4,121,789	5,075,237	7,519,296	9,346,901	12,258,922 (1897)

Karl Bernhard.

TOYS.

Germany has two towns—Nuremberg and Sonneberg—which form centres of the toy industry. They have become famed not only for their historical development, but chiefly on account of their great productivity, and of the important part they play in the commerce of the world. In olden times the collective name of "Nuremberg toys" owed its origin to the fact that in the middle ages till the 18th century Nuremberg was the great commercial trading place for toys of all kinds.

Long before Nuremberg had any toy factories of its own, its merchants travelled to the most distant parts of the globe with the products of the mountainous districts of Bavaria, Thuringia, Saxony and of other parts of Germany, and this gave rise to the old saying: "Nuremberg toys all the world enjoys." After a time, however, Nuremberg was successful in becoming world-famed for its own products and in developing like Sonneberg —the seat of the Thuringian toy manufacture—into one of the principal centres of the German toy industry.

In order to complete the list of the German toy manufacturing towns several other places must be mentioned, in some of which the industry has been carried on for many years, and others where it has only begun of late years to develope.

One of the most noteworthy of these is the town of Fürth in Bavaria, where toys are manufactured greatly resembling those of Nuremberg. In the Kingdom of Saxony the towns of Dresden and Zwickau with their surrounding suburbs especially deserve attention on account of their extensively developed wooden toy industry; among the other Confederate States (Alsace-Lorraine has almost no toy industry) only the duchy of Saxe-Coburg-Gotha, with its rich production of china and papier maché toys, is prominent.

Nuremberg and Sonneberg, however, on account of their leading position in the commerce of the world, and of their own peculiar style of manufacture, rank as the chief representatives of the German toy industry, and are classed as such at the Exhibition, although divided into two separate groups.

In the following short account of the general conditions of the German toy industry, these two towns are especially dwellt on.

One glance at the products of the Nuremberg industry suffices to show their characteristic qualities both as regards material as well as nature of the articles. In no other part of Germany where toys are manufactured has metal, chiefly tinned sheet iron, and tin, and their alloys, such extensive and manifold application as in Nuremberg and her sister town Fürth. Of the 300 toy establishments of these two towns, 200 belong to the metal toy branch in which department 3,035 persons are employed, whilst the total number of hands employed in the Nuremberg-Fürth toy industry is about 5,000. The last figure may appear small considering the great importance of this industry; it must be remembered, however, that the "domestic industry" which in other toy manufacturing districts forms such an important feature, hardly comes into consideration at all there, and that in the manufacture of tin toys by machinery, manual labour is to a great extent entirely dispensed with.

In the production of tin toys Nuremberg distinctly holds its own. It is probable that this industry has developed from the old handicraft of the tin-smith, which in former years flourished in Nuremberg, and which has been forced by the growth and development of mechanical industry to gradually abandon old fashioned manual methods.

At present Nuremberg has many establishments in this branch, which were only a short time ago comparatively small beginnings, but which have now developed into large concerns. Through the skilful usage of the material and the application of automatic machinery and tools,—which not only allow of greater production in a comparatively short time, but also reduce the expenditure, and consequently also the prices of the articles, together with the fact that the commerce of Nuremberg as far back as middle ages was in a fairly prosperous condition, manufacturers have succeeded in raising the tin toy industry to an almost unparalleled extent.

Among the products in this category are: railway trains with all their appurtenances—the manufacture of which was suggested by the first German railway in the year 1835, which ran between Nuremberg and Fürth—ships and complete equipments for vessels, magnetic toys (swimming animals) and other mechanical figures, magic lanterns, kinematographs, phonographs, tops, rattles, trumpets, swords, steam-engines, mills, fountains, dolls' services, &c. Models of machinery, optical and electrical toys are made to such perfection that children are able to derive great instruction as well as amusement from them.

An important branch which helps to make the Nuremberg-Fürth toy industry so famed is the manufacture of tin toys, especially lead soldiers. As

long ago as the 18th century, figures were made out of an alloy of tin and lead, and were sent to all parts of the world by Nuremberg merchants. The figures made by a certain Christian Hilpert of Nuremberg, who died in 1792, were highly valued. At present, millions of tin soldiers representing the armies of every country are manufactured every year and sent to the market. The figures are cast in moulds of slate which have been fashioned from drawings of artists; for the so-called full figures the mould is generally cut in metal according to a plastic model. Other tin toys, made in a similar manner, representing dolls' furniture, chandeliers, candlesticks, kitchen utensils, frames, &c. and even altar decorations of every kind, are also very popular amongst children.

At Fürth the manufacture of tin toys as articles of commerce began to develop in the middle of the 18th century. At present there are 20 establishments at Nuremberg and Fürth emoplying about 150 hands, though three and four times as many people are engaged in their own homes (so-called "domestic industry") in painting the tin figures. These are made in every kind and quality, and the prices differ accordingly; for example, for five marks, a gross of boxes, each box containing 800 soldiers, can be obtained, whereas some other figures cost as much as five marks each. Boxes containing whole camps, artillery parks, regiments with their officers, men, band, buglers and even the smallest detail are supplied. Nuremberg and Fürth send tin toys to the value of about a million marks annually to the market, two-thirds of which are exported to other countries.

Nuremberg has 44, and Fürth 8 establishments for the manufacture of wooden, horn, and such like toys. These manufacture magic boxes, croquet-games, all turned goods, work boxes, dolls' houses, stables, shops, fortresses, wooden snakes, games of lotto, tivoli, draughts and dominoes, &c. Ordinary wooden toys such as fanciful little houses, dolls' beds, &c., are sold by the dozen for a few pfennige, and are made at Oberammergau and Berchtesgaden in Bavaria, where the large forests enable wood to be obtained very cheaply. In the mountain districts of the Rhön wooden toys are also made, and consist chiefly of animals, carriages and carts of all kinds; they are principally sent to the Nuremberg and Fürth markets.

For the manufacture of all card-board and paste-board toys, such as band-boxes, scrap books, transfer pictures and theatres, Nuremberg and Fürth have 23 establishments. The transfer pictures have an especially large trade, for they are not only used for decorating all sorts of toys, such as wooden boxes, dolls' furniture, botanical boxes, &c., but they are sold in many thousands of little books every year for the amusement of children.

The older articles of the Nuremberg toy industry,—children's whips and counters—are also of great importance, the latter, made in metal, being called "Dantes"; these latter are exported in large quantities to the east.

Widely different to the Nuremberg toy industry is that of Sonneberg in Saxe-Meiningen. The Sonneberg toy industry looks back upon a history of many hundreds of years, and owes its origin and continuity to the large

quantities of excellent wood supplied by the forests of Thuringia. Even to-day wooden toys play an important part in the Thuringian toy industry; from this oldest branch and the home industry founded on it, however, new branches of the toy industry have developed, some of which have become of paramount importance.

Sonneberg is the centre and market of the whole of the Thuringian toy industry, and therefore all products made within a radius of twenty miles of Sonneberg are called Sonneberg toys, and as such, go to all parts of the world; Sonneberg, in friendly competition with Nuremberg, has been successful in being recognised in the international market as one of the most prominent centres of the German toy industry.

Whilst at Nuremberg metal is chiefly worked and made into innumerable railway trains, fleets, models of machinery, swords, trumpets, tin soldiers &c.,—chiefly toys used for the growing masculine population,—Sonneberg, on the other hand, chiefly produces wooden, porcelain, glass and papier-maché toys for the female world, and sees that the future mothers and housekeepers are provided and well stocked with dolls and all household articles.

Nuremberg and Sonneberg each succeed in bringing their products to such high perfection, that each of the towns manufactures a speciality of its own, which forms its chief industry; in this way they are easily able to hold their own against the products of other countries.

In the Sonneberg toy industry the papier-maché goods hold a very important position. This branch of the industry had its origin from the art of wax modelling, which was especially popular in the 18th century, and consisted in modelling by hand portraits and little figures out of clay and wax.

At the beginning of the 19th century, toys were still made by hand by kneading a mixture of small pieces of paper, sand and glue together. In the following years, the price of wood went up, which made the sale of toys more and more difficult, and the industry found a quicker and ever increasing market by the introduction of an easier, more profitable and highly successful method of pressing the mixture in moulds.

The Sonneberg dolls vary considerably in price,—from about 60 pfennige the dozen, to 12 marks and more apiece. The cheaper kinds are chiefly made in the little neighbouring districts belonging to Sonneberg.

At Neustadt—the neighbouring town of Coburg—dolls are made in most various kinds and qualities; in spite of this industry being at home as it were in Coburg, still that town, as well as Rodach, Eisfeld, Hildburghausen, and other places, is looked upon as being affiliated to the Sonneberg industry. During the last twenty years, dressed dolls have become quite an important industry. Dolls with wax heads have gone very much out of fashion of late years, partly on account of their fragility and sensitiveness to touch and climate. To some extent they have been pushed out of the market by the papier-maché and porcelain dolls.

The demand for doll's heads is a very large one. In some of the establishments of Sonneberg the number manufactured every day reaches several

thousands of dozens. Domestic industry plays an important part in making doll's heads out of papier-maché and wood, in making and stuffing the dolls' bodies of linen and leather with hair, sea-weed, or wood-shavings, and also in making dolls' clothes.

Under the category of Sonneberg papier-maché goods, stuffed animals for young children, which are almost works of art—so much care is bestowed on their manufacture—are also classed. These animals are made of felt, plush and fur; and ingenuity has gone so far that they even count milkable cows among their number, show-pieces fitted up with machinery, speaking dolls, and all the various movable figures children are so fond of playing with, are also to be found under the heading of papier-maché goods.

Amongst the most important Sonneberg wooden toys are ships and boats in all varieties of shape, size and colour. Then come shooting targets, grazing cattle, menageries, horses and stabling, theatres, paint-boxes, work-boxes and all kinds of round games.

One of the branches of the Sonneberg toy industry which has greatly increased lately, is the manufacture of glass decorations for Xmas trees. This branch is chiefly carried on in Lauscha, Ernstthal, and Steinheid. Glass marbles, beads, and transparent drawing frames are made in great numbers.

The above branch of the industry which has existed many hundreds of years is very closely allied to the doll industry in Thuringia, as all the necessary eyes required for the millions of dolls' heads every year are manufactured in it.

Another very important department—especially of late years—of the Sonneberg industry is the manufacture of Easter eggs, and all the various fancy articles used for celebrating Easter, such as Easter hares, hens, &c.

In order to encourage, develop and raise the standard of the domestic industry of porcelain and earthenware toys, a School of Industry was built in the year 1883 by the manufacturers of Sonneberg and the neighbouring districts, which ever since its foundation has been partly supported by the duchy of Saxe-Meiningen and the town of Sonneberg.

In other parts of Thuringia, toys are also made in great quantities; in Waltershausen and Ohrdruf in Saxe-Gotha, dolls, animals covered with fur, carriages, &c., and in Ilmenau in Saxe-Weimar dolls' heads, dolls' bodies and surprise toys. Also in the many porcelain factories of Thuringia, dolls, dolls' heads, all porcelain toys, and dolls' services are largely manufactured.

The total number of hands employed in the Thuringian toy industry exceeds 30,000. Of these more than 75 per cent are employed in the domestic industry. This unequal division renders the differences between the productive systems of Nuremberg and Sonneberg distinct. Whilst the one works with machinery, the other is dependent on manual labour, and this again is entirely due to the different kinds of raw material used.

To complete this account of the German toy manufacture, it is still necessary to mention the industry of the Erzgebirge, remarkable for the perfection of some of its branches. There the vast extension of the forests pro-

vides the home industry with the necessary raw material for wooden toys. The principal seats of the industry are Olbernhau, Grünhainichen and Waldkirchen, where the wholesale merchants of the goods manufactured in the neighbourhood reside. Certain specialities are made exclusively in certain villages; thus, for instance, the hamlet of Seifen produces little animals by the radial splitting up of wooden rings, turned on lathes in such a manner, that each section represents the outline of an animal, only requiring a few finishing touches from the carver. This clever process of production on a large scale explains the extraordinary cheapness of these goods.

Seifen is the oldest seat of the toy industry of the Erzgebirge; at the end of the 18th century Grünhainichen and Olbernhau joined in, and the importance of the whole district rose rapidly.

The total output of German toys represents a value of from 50 to 60 million marks, of which three-fourths are exported. The lion's share in the production is contributed by the towns of Nuremberg and Sonneberg, which supply about 90 per cent of all toys manufactured. Th. von Kramer.

METAL HARDWARE.

All sorts of hardware, of the most various kinds of metal, from the most beautiful objects of art down to the cheapest articles in everyday use, are manufactured in Germany, and form one of the chief branches of German trade.

After classifying the materials, German industrial statistics concerning metal work (group V) can be divided into three principal divisions, with 34 sub-divisions.

The following statistics are arranged on the above basis.

A. Precious Metals.

Gold, Silver and Jewelry. The best workmanship in fine gold and silver is to be found in places where the fine arts are cultivated, and where the works of artists have an opportunity of really influencing the taste and ingenuity of workmen. The museums and art-schools which exist in all the larger towns, possess samples of work done at various times in different countries, and are important factors in the development of the highest class of industrial art.

At Hanau, the chief town for the manufacture of gold and silver articles, goldsmiths' work was introduced in the 16th century by reformers from the Netherlands. From that time it has grown to be an important centre of German goldsmiths' work. A great deal of its success is due to the capital drawing school which was founded there at the beginning of the industrial period.

Pforzheim is one of the most important manufacturing towns for jewelry. About 600 establishments, turning over about 40 million marks annually, are engaged in the above industry there. Besides wholesale production, objects of a highly artistic stamp are turned out. There is a special school for training intelligent persons in gold and silver work.

There are large establishments for making silver table decorations and dinner-services in Geislingen and Schwæbisch-Gmuend. Taken altogether the German gold, silver and jewelry trade comprises 6,123 establishments with 34,145 hands, including home work given out to 557 places and employing 1,195 people.

Gold and Silver beating. This is an industry for the manufacture of gold and silver leaf employed for useful and ornamental purposes, viz., for gilding picture or mirror-frames, book edges, wrought metal work, &c., as well as for gold and silver paper.

The metal which is to be turned into leaf is smelted, cast into bars, rolled out, and then laid in strips, one on the top of another in the hammer mill, after which it is put between thin parchment (goldbeater's skin) and then beaten out as thin as possible with a goldbeater's hammer. Much the same kind of process is gone through for the production of bronze and tinsel colours which are stamped out of ingots. Real gold and silver bronze is made of the parings left over in the manufacture of gold and silver leaf.

Gold and silver beating was introduced into Germany in the 14th century. It came from the East by way of Italy. The first settlements were in Augsburg and Nuremberg, where the trade with Italy was then in a very flourishing condition. Later on it found its way into other towns in Germany, notably in Saxony. Now-a-days the chief centres are under the Bavarian government, viz. in the towns of Nuremberg, Fuerth, Schwabach and Roth-am-Sand.

The "gold and silver beating" branch comprises 265 establishments with 2,828 hands, including home work given out to 64 places, employing 272 people.

Gold and Silver Drawn Wire, Gold and Silver Braid and Thread. This industry which is known by the name of the "Leonic wire trade" was first introduced into France (Lyons) from Italy; from thence it was carried into Bavaria in the 16th century by French reformers; there the production of "Leonic" wire in the towns of Nuremberg, Weissenburg, Treuchtlingen, Allerberg and other places gradually developed into a world famed trade.

As far as the rest of Germany is concerned, the greatest number of factories of this kind of wire are to be found in the following Saxon towns: Annaberg, Chemnitz, Dresden, Freiberg and Leipsic.

Gold and silver wire is made in specially constructed wire drawing machines. Copper rods covered with varied thicknesses of either gold or

silver are drawn through cone-shaped holes in draw-plates made of the best and hardest steel; the perforations grow gradually smaller in size until the wire has the requisite thinness, the very finest sorts being drawn though drilled diamonds. Most of the factories for gold and silver wire also make gold and silver braid, lace, fringe, and everything used in the decoration of costumes, uniforms, ecclesiastical vestments, &c.

For the manufacture of gold and silver wire, braid, and thread, there are 455 establishments with 3,598 hands, including home work given out to 356 places and employing 223 people.

Mints and Stamping Works. The coining of German gold and silver money is carried on at the State Mints of Berlin, Munich, Dresden, Stuttgart and Carlsruhe.

There are a few establishments for stamping medals, commemorative coins, &c. in sterling and base metals; the best known are in Berlin, Magdeburg, Dresden, Nuremberg, Stuttgart, Frankfort-on-the-Main and Pforzheim.

In addition to the State mints, the coining and stamping establishments number 16 with 365 hands, including work done at home by one person.

B. Base Metals (exclusive of Iron and Steel).

Coppersmiths' Work. The general remarks upon gold and silver work given above likewise apply to coppersmiths' work of an industrial-art nature.

At the present day much is done for the satisfactory production of ornamental and useful articles made of chased or embossed copper, such as vases, flower pots, wine-coolers, bowls, &c. Berlin and Munich are at the head of this trade, and are followed by Dresden, Carlsruhe, Nuremberg and Stuttgart.

Copper articles of a purely industrial nature are being ousted out of the market by the growing taste for enamelled or lacquered sheet iron utensils.

There are 3,504 establishments for this industry with 10,596 hands, including home work given in 36 cases and occupying 105 people.

Copper and Brass Foundries, Ore and Bell Foundries. Under this heading we find armatures, taps and valves for machinery, pumps, gas and water work fittings, lamps, candlesticks, &c., finer sorts of cast bronze work, door handles, fittings, mountings, bells, &c.

The manufacture of these articles is carried on in several large towns in 1,031 establishments with 5,188 hands, including home work given out to 46 places and employing 167 people.

The Pewter Industry generally includes the making of useful articles for domestic use, especially drinking mugs made entirely of the metal, though it is often only employed for the lids. Berlin, Munich, Nuremberg and Nabburg are the chief towns for the manufacture of the finer sorts of pewter articles, such as dinner-services, &c. In this branch there are 1,032 establishments with 2,351 hands, including work given out to 32 places and employing 83 people.

Metal Toys. This is a very flourishing trade, and is a speciality of Nuremberg and Fuerth. Further information on this subject is to be found in the introduction to the group "Toys."

Number of establishments 244, employing 2,832 hands, home work in 86 places, employing 255 people.

Small Shot, and Bullet Factories. The chief places for this industry are Aix-la-Chapelle, Berlin, Neuss, Stolberg, and Durlach. The establishments number 15 with 285 hands, home work 1, employing 3 persons. Under the heading "Sundry Articles of Manufacture in Lead and Pewter," the German Industrial Statistic Office mentions 254 establishments with 2167 hands, including home work to 125 places, employing 149 people.

Zinc Foundries, and Zinc Ware Manufacturies. Zinc casting is largely employed in the making of works of art, such as bronze figures, candellabra, lampholders, &c.; it is also much used in architecture as cast and sheet zinc. The number of establishments 139 with 2,290 hands; home work given out to 2 places, employing 7 persons.

Manufacture of Aluminium Goods. Aluminium, which has been made so much use of within the last ten years, was first manufactured in 1827 by Prof. Wöhler at Gœttingen; the process was so improved by Deville of Paris in 1854, that large quantities could be turned out. The wholesale production of the substance dates, however, from 1888, when electricity was first used for eliminating the metal from its oxyde. Aluminium can be cast at 700° Celsius, and all sorts of objects are made of it for technical as well as scientific use. Raw aluminium is used for making dense cast iron, and as an alloy, especially in combination with copper in sheet form; it has of late been combined with other metals, particularly copper and iron, and rolled out as a bi-metallic sheet.

Sheet aluminium is used for many things, door and window fittings, furniture mountings, caskets, cylinders, cups, mugs, hinges, screws, building decorations, kitchen utensils, hunting flasks, scientific and musical instruments, &c. Aluminium has likewise been beaten out to leaf, and threatens to replace silver leaf; the same applies to aluminium-bronze dust obtained from the crushing of compact aluminium, which is often used as a substitute for real silver and pewter bronze. Aluminium wire is frequently employed instead of silver.

There are 27 establishments with 1,481 hands occupied in this trade, including home work given out to 5 places, employing 15 people.

Manufacture of Electro-plated Articles. By obtaining a metal deposit with the help of galvanism, a metal precipitate can be procured in a mould taken of an object, which after the mould (technically called a "matrice") has been removed, gives a lasting and exact copy of the article in question. Besides this, a slight metal covering can be given to any moulded figure; for instance, an embossed or cast copper mug can be provided with a coating of either gold or silver. The inventor of electro-plating was Moritz Hermann Jakobi, who was born at Potsdam in 1801, and died there in 1874. In 1839 he succeeded in obtaining galvanoplastic reproductions, but only from metal matrices; now-a-days they can be obtained from almost any kind of material which has been rendered conductive on its surface.

In the same way clichés, stereotype plates, copies of coins, medals, etched copper plates, large monumental figures and architectural ornamentation, capitals, festoons, &c., pipes, wires, plates, vessels, leaf metal, metal papers, raw products for the manufacture of bronze, and finally articles made of glass, china, crockery, articles made of animal and vegetable organisms, wood, textile things, and lace can all be metalized by this process.

There are celebrated works for electro-metalizing at Munich and Geislingen.

Altogether there are 177 establishments with 907 hands for the making of electro-plated articles, including work given out to 12 homes, employing 32 people.

Sundry Works for Base Metal (exclusive of iron and steel) and for the production of alloys. In this group are to be found: leaf metals, bronze and brocade colours, tin and copper foil, Leonic wire, braid and fringe of common metal, gold and silver paper, coin ornaments (chiefly made for the oriental trade), insignia, theatre jewelry, tin-foil, metal caps, pewter tubes, tin pipes, Christmas tree ornaments, &c. Chief places of manufacture: Nuremberg, Fuerth, and their surroundings; further, Britannia metal, German silver, alfenide goods, as also the manufacture of cables, drawn lead, brass and copper pipes, brass pins and safety pins, &c.

Number of establishments: 2,254 with 37,387 hands, including home work given out to 352 places, employing 955 people.

Braziers' Work. Braziers' specialities consist in military accoutrements, official uniforms, helmet-ornaments, belt and strap buckles, buttons, hooks, &c.; also mountings for furniture and trunks, leather and wood fancy articles.

Number of establishments 1,037 with 28,738 hands, including home work given out to 106 places, employing 184 people.

C. Iron and Steel.

Iron Foundries and Iron Enamelling. The manufacture of cast ironware is a process much used for various purposes, from the simplest articles, such as harness, stable, household and domestic goods, up to the most artistic productions in figures for architectural ornamentation.

There are 1,556 establishments with 84,977 hands that apply themselves to casting and enamelling iron, including work given out to 8 homes, employing 37 people.

Manufacture of Iron, and Tin-plate. There are 52 establishments with 6,461 hands for the manufacture of iron and tin-plate; they provide material for the great majority of the tin and ironmongers' establishments, and for the making of articles for building, kitchen and decorative purposes.

For wholesale Ironmongery there are 21,512 establishments with 49,953 hands, including home work given out to 434 places, employing 989 people.

Kitchen and Domestic-Articles, made of Embossed and Enamelled Iron-plate, have been very much in demand within the last twenty

years, and are preferred to ordinary black goods on account of their pleasing appearance.

The Manufacture of Lacquered Tin has also very much increased, especially in Nuremberg where large quantities are made.

For this ware, there are 1,384 establishments in Germany, with 31,238 hands, including home work given out to 81 places, employing 232 people.

The Nailsmiths' Trade has declined very considerably since the introduction of machine-made nails; there are, however, still 4,267 establishments with 4,837 hands at work, including home work given out to 583 places, employing 581 people.

The factories for Iron-wire are principally situated in the Rhine Provinces and Westphalia.

They comprise 171 establishments with 4,099 hands, including home work given out to 11 places, employing 22 people.

Manufacture of Rivets, Nails, Irons, Screws, Chains, and Rings. The chief places for the manufacture of these articles are likewise in the Rhine Provinces and Westphalia, after which come Upper Silesia and the South German States.

Berlin is one of the most important places for the manufacture of wood screws; Nuremberg for wire nails; there are 1,417 establishments with 16,936 hands, including home work given out to 688 places, employing 875 people.

The Blacksmiths' Trade is in respect to size the largest among the metal branches; there are 80,656 establishments with 142,351 hands, including home work given out to 1,400 places, employing 2,651 people.

This high figure is explained by the circumstance that machinery has not been able to replace hand work in the blacksmiths' trade, or where it is the case, only to a very slight degree. The blacksmiths' principal work is mounting vehicles of all sorts, making horse shoes, and shoeing the animals.

There are numerous schools for training blacksmiths, especially for the last named branch of the trade, carried on at the cost of the State and the various communities.

Manufacture of Locks and Safes. The German art-locksmiths' trade has almost attained perfection within the last few decades. All kinds of lamps, railings, gateways, staircase balustrades, door and furniture fittings are made and exported in great quantities.

An important part of the locksmiths' work includes the making of wrought iron furniture, such as bedsteads, washhand-stands, garden chairs and tables, &c., and the manufacture of safes and cash boxes.

This metal branch comprises 26,546 establishments with 104,905 hands, including home work given out to 1,148 places, employing 3,010 people.

Lightning Conductors are only manufactured by a few firms which make a speciality of them; there are 83 establishments with 109 workmen in the trade, which is generally carried on conjointly with that of an ironmonger or mechanic.

Tools, Scythes, and Cutlery. Anvils, windlasses, pulleys, pick-axes, shovels, spades, ploughs, scythes, shears, and all kinds of knives, forks, scissors, cut-and-thrust weapons, irons, &c. come under this heading.

The principal places for this industry are the Rhine Province (Solingen, Barmen, Remscheid), Suhl in Saxony, and Berlin. Number of establishments: 8,915 with 28,752 hands, including home work given out to 2,411 places employing 4,150 people.

Scissors, Knives, and Tool Grinders. There are about 4,725 establishments for this trade with 7,098 hands, including home work given out to 563 places, employing 1,018 people.

File cutting. Files were made entirely by hand till quite lately, but in the present day they are forged, ground and cut by machinery. The sharpening of blunt files, as well as the smoothing off of rough turned edges in new files is done with the help of the sand-blast.

There are 2,728 establishments for file making with 8,340 hands, including home work given out to 1,064 places, employing 1,669 people.

Manufacture of Steel and Iron Hardware. This includes door and furniture locks, hasps, padlocks, hinges and the ornamentation of chased, embossed, or open-work iron plate. Skates have to be reckoned among the steel articles which are mostly manufactured in the Rhine Provinces, then come steel rings for pianos and other musical instruments (Nuremberg), watch-springs, fret-saws (Augsburg), spectacle frames (Fuerth) and lastly cast steel bullets.

Number of establishments: 2,124 with 20,741 hands, including home work given out to 464 places, employing 949 people.

Sewing and Knitting Needles, Pins and Crochet Hooks are chiefly made in Westphalia, the Rhine Provinces (Aix-la-Chapelle, Iserlohn and Stolberg) and in Bavaria (Schwabach).

There are several thousand millions of these articles made in the course of the year. The establishments number 78 with 4,135 hands, including home work given out to 9 places, employing 26 people.

Pin and Wire Makers. Iserlohn is the chief place of the manufacture of hair-pins, hooks and eyes, wire-work fencing and wire netting. Nuremberg is also a great place for hooks and eyes.

The establishments in all Germany number 1,447 with 9,031 hands, including home work given out to 150 places, employing 251 people.

Steel Pens are manufactured in great quantities in Berlin and Leipsic-Plagwitz, and penholders at Bonn, in 6 establishments with 744 hands, including home work for 1 place, employing 2 people.

Altogether for the manufacture of metal hardware, there are: 174,240 establishments with 639,755 hands, including home work given out to 10,795 places, employing 20,105 people, 18,661 males and 1,444 females.

This total is divided into three principal groups:

A. Precious Metals. 6,859 establishments with 40,836 hands, including home work given out to 978 places, employing 1,691 people.

B. Base Metals. 9,714 establishments with 74,212 hands, including home work given out to 802 places, employing 1,952 people.

C. Iron and Steel. 157,667 establishments with 524,707 hands, including home work given out to 9,015 places, employing 16,462 people.

The average annual export of German metal hardware amounted in the last five years to 150,000 tons, with an average annual value in round figures of 40 million marks.

Th. von Kramer.

GLASS INDUSTRY AND CERAMICS.

The manufacture of glass and of ceramic products is based on a common foundation, for they both result from the practical working up of silicates or derivatives of silicic acid. But whilst the glass industry produces fusible silicates, which can be formed, when in a liquid state, into all kinds of useful articles, the ceramic art industry employs infusible silicates of argillaceous earth, the so-called clays which occur in nature, as its raw material, they having, when in a damp condition, plastic properties, and being able to retain the shape imparted to them when subjected to subsequent drying and heating processes. Thus, although the methods of work in the two industries are totally different, they have several points in common, for they are both of extreme antiquity and based on purely empiric foundations which have only quite recently been elucidated by science, and they are both extremely capable of lending themselves to artistic purposes; they must therefore be regarded from an artistic point of view as well as from a purely technical one. The former standpoint is discussed in the preface to "Art Industry," whereas in the present article it is proposed to review them from chemical and technical standpoints.

1. The Glass Industry.

It is probable that glass making was first introduced into Germany by the Romans, but it is a noteworthy fact that in the very beginning the German glass industry distinguished itself by a brilliant invention, considering the period in which it was made. It is a well known fact that the

Romans used natural soda imported from Egypt as the alkali indispensable to glass making. As the old German glass workers could only obtain this with difficulty, they replaced it by potash extracted from the charcoal of the wood they used.

The other raw material necessary for glass making, sand, is found in many parts of Germany, and thus the new industry was, from the outset, only dependent on its own country for raw materials, and it is to this fact that the rapid and constant growth of the industry is due. The early development of the mining industry in Germany supplied the glass maker with many oxides suitable for the production of coloured glass, and the good use to which the old practitioners put this commodity may be still seen and admired in the beautiful medieval stained glass windows of old German churches.

In the 19th century science concerned itself with the glass industry as well as with many other old trades, and thus prepared them for new progress and development.

The fundamental work of Schwarz demonstrated the principle underlying the extremely varying chemical composition of different glasses, and created a sound basis for the study of the composition of glass. The tedious experiments which in former times so often misled glass makers, disappeared with all their disastrous consequences, and an opportunity was created for the production of durable and resistant glass by methods based on scientific principles.

The potash so exclusively used during the middle ages was again partly replaced by soda after the development of the soda industry; and soda in its turn had, at any rate in cheap glass, to make room for sulphates. This cheap raw material, however, required greater heat for melting down than could be obtained in the furnaces of the old glass makers. There was yet another reason why these furnaces had to be abandoned: they were only suitable for wood as fuel, and the vast forests which had once covered almost the whole of Germany had gradually disappeared. The difficulties which arose from this state of things were most happily overcome by the invention of the regenerative gas heating system by Friedrich Siemens. This brilliant progress not only permitted temperatures to be obtained which could not otherwise be reached by the old furnaces, but poor fuel such as inferior lignite coal could be used, which made it possible to introduce the glass industry as a remunerative occupation in districts where it had previously not been able to exist. In its ultimate development the regenerative gas heating system transformed glass making from an intermittent process into a continuous one. This progress which, it is true, is only of advantage to those factories which produce vast quantities of cheap glass (such as bottle and window glass works), was realised by the invention of the vat furnace. Under such circumstances it is not surprising that regenerative gas heating, which had already caused great revolutions in many other branches of industry, was most rapidly adopted, and reached the highest state of perfection in the glass industry.

Siemens' original constructions have been supplemented by those of other engineers, some of which have found lasting favour.

The great importance of the gas heating system to the glass industry gives rise to the question, how many glass works have adopted the gas furnace? There are no official statistics on this subject, but the author of this article has attempted to find an answer by private investigations made in 1893 and 1898, which have furnished the following data:

In 1893, 312 glass works possessed a total of 255 gas furnaces. In 1898, 324 glass works had 320 gas furnaces in operation, a result which shews a marked progress of the gas system during the intervening five years. Of the 320 furnaces, 187 were constructed according to the Siemens' system, and 53 glass works were worked with vat furnaces of different construction.

The most important raw material for making glass, white quartz sand, is found in many places and in large quantities in Germany. It is of great importance that the sand should be free from iron oxide, as colourless glass can only be obtained under such conditions, the smallest trace of iron producing a greenish tinge. The occurrence of very pure sand in the neighbourhood of Aix-la-Chapelle, in the Lausitz, and Silesia has been the cause of an important glass industry springing up in those parts.

The necessary alkali salts are supplied to the glass industry by chemical works. A third ingredient of ordinary glass to be considered is limestone, which is to be had everywhere in a sufficiently pure state. For crystal glass, limestone is replaced by lead oxide or minium. Glass which contains both lime and oxide of lead is called half-crystal, and its production has increased of late, it being chiefly used for pressed glass articles.

The bottle glass industry, the products of which contain a good deal of iron and are consequently dark in colour, is dependent upon very cheap raw material which leads to the use of compound minerals such as granite and trachyte in the composition of bottle glass.

Coloured glass is obtained by the addition of various metallic oxides and other materials. There are but few factories in Germany which produce coloured glass, but their work is excellent although even in Germany it is not appreciated to the extent that it deserves to be. Chemicals which produce colour in glass have also some importance for the manufacture of white glass, as they are added in order to hide the greenish tinge resulting from the slightest traces of iron. Manganese peroxide, which was formerly exclusively used for this purpose, has of late been replaced with great success by small quantities of selenium and of didymium oxide.

The shaping of blown glass is still done by the old means of the pipe, and though many attempts have been made to introduce mechanical blowing apparatuses, they have led to no practical results. Great hopes are entertained for Sievert's new shaping process, which consists in pouring liquid glass upon perforated metal plates and subsequently tilting the latter. The glass sinking down by its own weight sucks in air through the metal plate, and the process is helped by compressed air being blown into the perforations. This process permits of the production of glass vessels of enormous sizes formerly unattainable; a modification of the process consists of pouring liquid

glass upon damp asbestos, the sudden generation of steam serving to blow the glass into a metal form placed over it.

The sheet glass industry utilises the well known process of cutting open a cylindrical vessel of large dimensions and flattening it out in a stretching oven. This industry is highly developed on the banks of the Rhine, in Saxony, Silesia, and the Lausitz. Some factories in Bavaria still produce very thick sheet glass which is finished by grinding and polishing.

The manufacture of real plate glass of large dimensions consists of pouring liquid glass upon metal tables and flattening it by rollers. The glass sheets thus obtained are finished by mechanical grinding and polishing. The two largest plate glass factories in Germany are at Stolberg near Aix-la-Chapelle and Waldhof near Mannheim, both belonging to a French company.

The industry of pressed glass stands in the same relation to the production of blown hollow glass, as the plate glass industry to the manufacture of sheet glass. American influence is traceable in the development of this process, which has obtained a good footing in Germany, and is carried on as a supplementary occupation by many glass works. For pressed glass the introduction of regenerative gas heating has been of vital importance, as only by its help can glass be obtained in a sufficiently liquid and clarified condition.

The crystal and half-crystal glass industry is less highly developed in Germany than might be expected, although it is true that there are a few very important works of the kind. Of these the largest is in Lorraine, where it was established more than 100 years ago by a French company. A few other factories on the Saar and the Moselle are likewise of French origin. A large factory in the neighbourhood of Cologne and the well known Josephinen-Hütte in Silesia are probably the only large crystal glass works which owe their existence to German enterprise. Of late, art objects consisting of coloured crystal glass in many layers, elaborately ground and engraved, have come into fashion, and have shown once more that it is impossible always to replace real lead crystal by half-crystal.

Glasses especially manufactured for scientific purposes are not produced in such large quantities as those hitherto mentioned, but they are particularly interesting on account of the extraordinary progress made in Germany in their production during the last twenty years. Two kinds of these glasses have to be considered, optical glasses, and glasses for chemical and physical use. The manufacture of the former began in Germany more than a century ago, and Fraunhofer's work on this subject secured for them at once a good reputation. Their production was small, and large quantities of both crown and flint glass had to be imported from France and England. In the beginning of the eighties Prof. Abbe of Jena showed that further progress in the construction of optical instruments was only possible if a greater variety of optical glass were placed at the disposal of the working optician. Together with Dr. Schott, and supported by the Prussian Government, he started ex-

perimental works at Jena with the object of preparing glasses of varied composition and of examining their physical constants. Immediate success crowned these endeavours and to such an extent that very soon the experimental works became a large factory, which at present supplies almost the whole world with glass for fine optical instruments. Countless experiments have led to the definite adoption of a number of glasses which possess optical constants totally different from the old crown and flint. Baryta enters largely into the composition of these glasses. Schott's glass works did not, however, confine their efforts to optical glass, but tried with equal success to improve the glass necessary for the manufacture of physical and chemical apparatuses.

The first problem to be solved here was the production of glass free from the troublesome fault of thermometric depression. Various compositions have been found to answer this purpose; a glass which is free from depression and yet very resistant to chemical attacks is the so-called "Geräte"glass, and the latest novelty—"Borosilicate"glass—has the additional advantage of a very high melting point. It must be mentioned that Schott's invaluable work has been to some extent supplemented by the Imperial Physical Institute of Berlin. Undoubtedly it had a very beneficial influence on the whole of the German glass industry. A great improvement is noticeable in all glass intended for chemical purposes, and the fact that baryta and boric acid are frequently met with in new glasses shows that factories which were formerly content to work according to the old rule of thumb have now called in science to their aid for the improvement of their products.

As an appendix to optical glasses, a peculiar industry may be mentioned which works for the wholesale market. It is the industry of watch and spectacle glasses, the output of which is so large that the greater part of it has to be sold in foreign markets. These glasses are partly cut out of large balloons, a process which reduces the necessary grinding and polishing to a minimum. The greater number of the factories concerned are situated in Lorraine and the Bavarian Palatinate.

The importance and variety of the German Glass Industry is best shown by the following statistical data:

A. Production.

	Quantity in tons	Value in marks
1. Hollow glass	133,272	42,310,000
2. Green glass	58,835	29,675,000
3. Blown plate glass. .	13,774	10,285,000
4. Window glass	78,487	17,502,000
5. Rolled plate glass . .	39,547	14,686,000
6. Glass beads, &c. . . .	991	757,000
	—	115,215,000

B. Import and Export.

	Common green glass			Fine white hollow glass			Window and plate glass			Watch and spectacle glass		
	1894	1898	1902	1894	1898	1902	1894	1898	1902	1894	1898	1902
Value*) of import	—	0,1	0,1	0,1	0,2	0,5	0,4	0,4	0,6	0,2	0,5	0,4
Value of export . .	12,7	9,9	11,9	5,5	6,0	7,1	3,2	3,2	8,0	2,7	3,1	3,9

II. Ceramics.

The ceramic industry, which in the widest sense of the word also embraces brickmaking, is to be found in every part of the German Empire, where it has existed since time immemorial. It is dependent even more than the glass industry on local conditions; its development has consequently been different in various parts of the Empire. Modern means of locomotion have rendered this industry more independent, yet the fact remains that the occurrence of large beds of clays of peculiar properties invariably gives rise to the formation of a dense group of factories of a decided character.

Common clays, which contain a large percentage of iron oxide and very often also of lime, are not very resistant to fire, and are generally utilised for brickmaking and the production of common pottery. Their occurrence is very frequent. The better classes of clay, especially those which turn white after burning, are greatly appreciated, and are frequently found. They are worked up with great care for a better class of goods. Highly refractory clays are somewhat rare, but Germany can boast of some deposits of these in Silesia, in Hesse, and on the Rhine, which are of extraordinary magnitude, and serve for the production of refractory bricks and goods for industrial purposes. Peculiar kinds of refractory clays which at the same time are very plastic are met with in stone-ware clays. Owing to a certain amount of felspar which they contain, they are capable of producing a dense non-porous substance when subjected to a very high temperature. Most of these clays turn gray or brown on being burnt, and have been used for centuries in the production of stone-ware covered with a salt glaze and embellished with blue ornaments by means of cobalt oxide. Stone-ware, the production of which formed an excellent school for the subsequent invention of porcelain, has assumed a great importance in our times, being very suitable for the construction of large and highly resistant vessels and apparatuses for chemical and other industries. The manufacture of floor tiles of great hardness and impermeability is also dependent on the use of stone-ware clays.

The purest and most refractory clays are called Kaolines, large deposits of which are found in the kingdom of Saxony, in the neighbourhood of Halle, near Passau in Bavaria, and in Silesia. They were not utilised in former times, and have only obtained their present importance through the invention of the manufacture of porcelain, which as everybody knows was introduced in 1709 by the alchemist Böttger. The German Kaolines cannot be used in their crude

*) In millions of marks: amounts under 100,000 marks are not included.

state for the manufacture of porcelain, but have to be mixed with felspar which is generally imported from Norway and Sweden. Quartz is also added sometimes, though the Kaolines contain parts of it in their original state. In consequence of the addition of felspar, porcelain enters into partial fusion when being heated and loses its porosity. It is well known that the burning of porcelain is accomplished in two separate operations, and that a mild heat is given in the first, whilst the highest temperature attainable is necessary in the second. Between the first and second heatings the article is dipped into glaze, which in its composition is similar to porcelain itself but more fusible. Porcelain is very often decorated by rich painting and coloured glazes, and it is certainly the most exquisite material for all artistic endeavours in connection with pottery. The painting of porcelain can be done either under or over the glaze; in the former case the colours must be able to resist the high temperatures at which the porcelain is burnt. Colours painted on the glaze can be burned in at the temperature best suited to them in muffle furnaces.

The necessity of mixing various materials for obtaining proper porcelain masses has led to the application of clay mixtures in other domains of the ceramic art. The preparation of such mixtures has been made easy and reliable by Seeger's important investigations concerning the influence of the various constituents of clay on the formation of the ceramic object. Seeger's "rational analysis of clays" enables a better idea of the nature of a clay to be obtained, and allows the features lacking in clay required for a special purpose to be ascertained. Clay mixtures or "artificial compositions" are therefore largely used now-a-days in all the various branches of pottery.

There is no industry in which "artificial compositions" are more important than in the manufacture of the better classes of earthenware, which were originally introduced from England. They produce ware of a white or light coloured porous body from a mass composed of white plastic clay, felspar and ground flint, which is covered with a transparent plumbiferous glaze. As the heat of the earthenware furnace is much lower than that of the porcelain furnace, earthenware may be decorated with a large variety of under-glaze colours, which are generally applied by mechanical processes. Though the products of the earthenware industry cannot compare with porcelain either in durability or in the good taste of their decoration, yet they go a long way in supplying the wholesale market.

Clays which do not turn quite white on being burnt form the material for the many varieties of common earthenware and majolica, the glaze of which always contains lead and sometimes tin. Common earthenware is manufactured in a great many places in Germany, but mostly in small establishments which have recently met with a great deal of encouragement from artists' circles.

The manufacture of white earthenware is generally carried on in large factories, some of which, and notably those of Saargemuend, Dresden and

Schramberg, have developed to an extraordinary size, and give occupation to thousands of workmen.

Stoneware, especially that for chemical use, is manufactured at Charlottenburg near Berlin, Krauschwitz in Silesia, Zwickau in Saxony and in various places in Baden, Hesse and on the Rhine. A good many factories are occupied with the production of stoneware pipes. A special kind of stoneware which is remarkable for its light colour, and therefore capable of coloured decoration is manufactured in the famous works of Messrs. Villeroy & Boch at Mettlach-on-the-Saar, and used both for vessels and for very pretty and extremely durable tiles. The latter are shaped in a dry state by powerful presses; similar tiles are also manufactured in other parts of Germany, for instance in the neighbourhood of Dresden.

A peculiar ware, similar to stoneware, only slightly porous and covered with a brown and white glaze prepared from mixtures of clays, is the so-called "Bunzlauer Geschirr," which is manufactured at Bunzlau in Silesia from clays in the neighbourhood. This ware is well known for its durability, and enjoys a ready sale in all Germany.

The manufacture of porcelain is without any doubt that branch of the ceramic industry which has reached the highest perfection in Germany. It is true that amongst the many porcelain factories of Germany there are some which have only developed the technical part of their industry, and, working for wholesale exportation only, leave much to be desired from an artistic point of view; on the other hand, however, there are many that have cultivated both directions, and justly enjoy universal fame. Of these the two Royal Works of Meissen and Berlin are in the first rank.

The Royal Saxon Porcelain Factory at Meissen is, as everyone knows, the oldest porcelain works of Europe, and is still the largest. In its products it justly clings to the old traditions of the rococo period from which it dates its fame. Yet it is always open to modern artistic ideas; in its technical development it is unsurpassed. The purity of its porcelain and the gloss of its glaze are too well known to be specially insisted upon here. No other factory has such a variety of under-glaze colours, and no less admirable is its dexterous management of the difficult technique of pâte-sur-pâte.

The Royal Prussian Porcelain Works at Berlin have gone through a peculiar development; they were founded in 1750 as a private enterprise, bought up by Frederic the Great in 1763, and have been managed since then by the Prussian Government according to varying principles. At present they are supposed to be in a large measure instrumental in stimulating the ceramic art in Prussia. Large sums are devoted to the solutions of problems of the ceramic art, and not so much attention is devoted to the culture of old traditions as to the creation of new achievements. We cannot here go into the discussion of the very original and remarkable artistic productions of the Royal works, but we will enumerate a few of their technical achievements. We may draw attention to the fact that objects of an extraordinary size, such as baths, have been produced in the works. The introduction of

peculiar coloured and flowing glazes must be mentioned here, as well as glazes which contain well developed glistening crystals. Of no small importance are also the experiments of the factory in the domain of the production of new porcelain compositions which may be burned at low temperatures, and consequently allow of a greater abundancy of under-glaze colours than ordinary porcelain. These products, known under the name of Berlin soft porcelain, possess an agreeable milk white colour, and are totally different in their composition from the phosphate or bone porcelain so largely manufactured in England.

Of the private porcelain factories, many are distinguished by a combination of exquisite technical skill with refinement of artistic treatment.

A peculiar branch of the porcelain industry, represented by a number of factories, devotes its attention to the manufacture of goods for chemical and technical use. In this branch the Royal Porcelain Works at Berlin take a prominent position, producing apparatuses of the greatest resistance to high temperatures and chemical attacks, and solving successfully the most difficult problems as far as complicated shapes and sizes of objects are concerned. Special methods are used for the wholesale production of telegraphic isolators and small parts of electric apparatuses which have to be very exact and uniform in shape. Besides the Royal Works, the firm of Messrs. Schomburg in Berlin, whose works are very extensive, must be mentioned here.

The foregoing sketch cannot claim to be complete, but it may be supplemented by a few statistical data.

According to the statements of the Potters' Trade Association there were in Germany in the year 1898 a total number of 939 ceramic establishments with 71,883 workmen. This does not include brickmaking works, which form a trade association of their own. In that industry there were 12,567 establishments with altogether 280,702 workmen.

Among the 939 ceramic establishments there were:

187	porcelain works	with	34,030 hands
43	earthenware factories	„	15,341 „
43	porcelain-painting establishments	„	872 „
16	Kaoline mines	„	216 „
343	stove works	„	10,083 „
116	potteries	„	1,503 „
27	stoneware factories	„	1,746 „
18	tile factories	„	1,021 „

The largest number of establishments is found in Prussia (499), Bavaria (99), and Saxony (81).

The following statistics give an idea of the importance of the ceramic industry in Germany:

A. Production.

The following quantities of various ceramic objects were produced in Germany in 1897:

	Quantity in tons	Value in Marks
1. Porcelain goods . . .	78,148	51,257,137
2. Earthenware goods .	66,267	27,345,003
3. Stoneware goods . .	58,858	3,368,820
4. Tiles	114,377	9,721,087
5. Various	—	22,085,409
	—	113,777,456

B. Import and Export.

	Earthenware			Porcelain, white			Porcelain, painted		
	1894	1898	1902	1894	1898	1902	1894	1898	1902
Value of import in millions of marks	1·8	2·1	1·6	0·2	0·2	0·17	0·6	1·1	1·4
Value of export in millions of marks	6·9	9·7	10·6	1·4	3·4	4·5	11·9	30·3	47·8

Otto N. Witt.

TEXTILE INDUSTRY.

The textile industry occupies the first place in the list of German trades. It comprises, indeed, a much smaller number of establishments than all other industries, but nevertheless it gives employment to the greatest number of hands, amounting to about one tenth of all those persons industrially active, and also boasts the largest exports and imports. It is especially noteworthy that this prominent position has been attained in spite of the fact that very few of the raw materials required in its operations are produced in Germany, and that they have therefore to be imported from distant countries at great trouble and expense.

According to the government statistics of 1895 the textile industry of the German Empire embraced 248,617 establishments, of which 162,435 belonged to domestic industry. This latter is characterized by the fact that it is carried on principally at home, and is occupied in executing orders for outside firms. It has obtained footing a principally in the mountainous districts of Silesia, Thuringia, Saxony, Bavaria, &c., but has declined to a considerable extent recently, owing to its inability to compete with large manufactories; the above number must consequently have greatly decreased by now.

The fluctuations in the consumption of textile goods from various causes, and the fact, that in a number of cases workmen without special training can be employed, has led in many instances to the development of the textile trade into a subsidiary one. The existence of a strongly developed domestic industry on the one hand, and the possibility of the production of certain goods without manual assistance or the use of motors on the other hand, leads to the existence of a large number of so-called "single person" establishments, employing no auxiliary aid whatever.

The following summary shows the prevailing proportions:

Total number of establishments	principal establishments	subsidiary establishments	The establishments are divided into to					
			establishments employing labour			"single person" establishments		
			total	principal establishments	subsidiary establishments	total	principal establishments	subsidiary establishments
248,617	205,292	43,325	57,792	56,759	1,168	190,690	148,533	42,157

A glance at the class "principal establishments" makes the following division into small and large establishments possible:

a) Small establishments	1 person		148,533	"single person" establishments	
b) Medium establishments	2 to 5 persons		44,825	establishments employing labour	
	6 „ 10	„	3,586		
	11 „ 50	„	5,088		
c) Large establishments	51 „ 200	„	2,427		
	201 „ 1,000	„	801		
	over 1,000	„	32		
	Total . . .		205,292	establishments	

In 1895 the number of persons employed in the 205,292 principal establishments was 993,257. Of these 532,037 were males and 461,220 females, 148,533 of the total number belonging to "single person" establishments, and 844,724 to establishments employing labour. Consequently the textile industry forms the chief vocation for one person in every 52 of the 52·25 million inhabitants of the German Empire.

A division into owners, staff and workmen results in the following figures:

	Male	Female	Total
Owners of establishments employing no labour	81,879	66,654	148,533
Owners of establishments employing labour .	47,714	4,196	51,910
Staff	42,611	1,489	44,100
Workmen	359,833	388,881	748,714
Total . . .	532,037	461,220	993,257

A comparison of male and female hands shows that the number of females nearly equals that of the males; amongst the workmen alone the number of females exceeds the number of males employed by 29,000 in round

numbers. Children are largely employed, the percentage being about 8·8 of the total. There are 10,901 apprentices, of whom 8,710 are males and 2,191 females.

In the following table the branches of the textile industry represented in Germany and their extent are shown. The last column of the table stating the number of persons employed refers only to principal establishments.

	Total number of establishments	Of these		Number of persons
		principal establishments	domestic industry establishments	
a) Preparation of spinning material	1,157	924	113	17,237
1. Silk drying	8	8	1	178
2. Wool preparation	969	834	105	16,358
3. Flax steeping and scutching	180	82	7	701
b) Spinning	9,124	7,721	4,430	183,543
1. Silk winding	140	131	104	232
2. Silk spinning	1,458	1,207	1,242	6,577
3. Wool spinning	2,611	2,326	705	54,488
4. Mungo and shoddy preparation	162	153	34	7,390
5. Flax and hemp combing and spinning	1,662	1,373	746	22,228
6. Jute spinning	33	32	—	8,645
7. Cotton spinning	2,446	1,991	1,432	74,807
8. Vicuna wool spinning	107	106	—	8,235
9. Spinning of other material	150	124	50	679
10. Spinning of unspecified material	355	278	117	302
c) Weaving, including ribbon weaving	144,548	119,326	100,121	508,010
1. Silk weaving	17,658	16,859	15,349	56,082
2. Wool weaving	26,035	23,756	19,755	153,098
3. Linen weaving	50,453	34,493	24,543	67,792
4. Jute weaving	187	112	132	5,839
5. Cotton weaving	32,751	28,997	27,553	147,121
Carried over	291,214	240,903	196,539	1,336,542

	Total number of establishments	Of these		Number of persons
		principal establishments	domestic industry establishments	
Brot. forward . . .	291,214	240,903	196,539	1,336,542
6. Weaving of mixed goods	16,332	14,495	12,664	77,292
7. Weaving of unspecified material	1,132	614	125	786
d) Rubber and hair-plaiting material	2,585	1,423	2,162	3,852
e) Knitting industries and stocking making	35,740	29,864	23,961	80,688
f) Crochet, embroidery and lace manufacture	21,660	18,253	15,277	43,674
1. Crochet and embroidery .	9,242	7,359	5,892	14,599
2. Lace manufacture and linen embroidery	12,418	10,894	9,385	29,075
g) Bleaching, dyeing, printing and finishing	9,607	8,458	2,297	102,825
1. Silk dyeing and printing	311	300	86	6,732
2. Wool dyeing and printing	1,789	1,653	245	22,731
3. Linen bleaching and dyeing	802	633	243	5,671
4. Cotton bleaching and dyeing	1,223	1,109	358	32,618
5. Finishing for stockings and knitted goods	618	506	434	5,556
6. Washing and bleaching of laces, &c.	778	575	727	1,156
7. Other bleaching and dyeing establishments	4,086	3,682	204	28,361
h) Trimming manufacture	16,367	12,368	13,734	32,511
i) Cordage	7,829	6,955	340	20,917
1. Rope manufacture	7,131	6,352	207	17,464
2. Manufacture of nets, sails and sacks	698	603	133	3,453
Total	248,617	205,292	162,435	993,257

The number of machines used in the textile industry, according to the statistics of 1895 is as follows:

1. Carding machines	in	2,054	establ.	31,229	machines
2. Combing machines	„	285	„	5,248	„
3. Mule machines	„	1,159	„	6,308	„
4. Roving machines	„	907	„	19,060	„
5. Spinning frame machines	„	2,017	„	10,071,551	spindles
6. Jacquard hand looms	„	5,801	„	22,968	machines
7. Jacquard power looms	„	1,013	„	40,918	„
8. Hand looms without Jacquard machine	„	22,304	„	73,994	„
9. Power looms without Jacquard machine	„	2,657	„	255,295	„
10. Spinning mills for the production of gold, and silver threads, hand power	„	56	„	99	„
11. Spinning mills for the production of gold and silver threads, motor power	„	31	„	134	„
12. Hand ribbon looms	„	2,417	„	5,380	„
13. Power ribbon looms	„	1,081	„	8,703	„
14. Hand twine machines	„	424	„	753	spindles
15. Power twine machines	„	1,395	„	17,353	„
16. Hand bobbin and plaiting machines	„	171	„	551	machines
17. Power bobbin and plaiting machines	„	353	„	24,018	„
18. Hand bobbin-net-machines	„	149	„	283	„
19. Power bobbin-net-machines	„	265	„	1,568	„
20. Hand embroidering machines	„	2,116	„	4,320	„
21. Power embroidering machines	„	491	„	2,381	„
22. Hand multifold embroidery machines	„	119	„	295	„
23. Power multifold embroidery machines	„	1	„	40	„
24. Hand stocking looms	„	2,274	„	9,465	„
25. Power stocking looms	„	462	„	11,018	„
26. Hand warp machines	„	2,450	„	5,588	„
27. Power warp machines	„	220	„	3,780	„
28. English hand looms	„	103	„	320	„
29. English power looms	„	71	„	828	„
30. French hand looms	„	234	„	1,360	„
31. French power looms	„	225	„	8,434	„

Motor power was used in 12,365 establishments, 11,115 establishments using 515,583 horse power. This power was developed by:

Wind	16	establishments	—	horse	power
Water	1,936	„	65,125	„	„
Steam	7,693	„	446,886	„	„
Gas	1,151	„	2,858	„	„
Petroleum	100	„	278	„	„
Benzine or ether	194	„	337	„	„
Hot air	39	„	67	„	„
Compressed air	2	„	32	„	„
Electricity	169	„	—	„	„
	11,300	establishments	515,583	horse	power

The textile industry is very unequally distributed throughout Germany. This is best shown by the following table, in which the number of persons given refers only to principal establishments, which are, however, not specified:

Province of East Prussia	1,960	establ.	altogether	3,074	persons
„ „ West Prussia	672	„	„	1,301	„
City of Berlin	2,914	„	„	15,266	„
Province of Brandenburg	7,454	„	„	54,474	„
„ „ Pomerania	1,912	„	„	3,184	„
„ „ Posen	765	„	„	1,534	„
„ „ Silesia	33,498	„	„	90,911	„
„ „ Saxony	9,141	„	„	22,809	„
„ „ Schleswig-Holstein	2,474	„	„	7,279	„
„ „ Hanover	3,315	„	„	22,690	„
„ „ Westphalia	7,087	„	„	37,269	„
„ „ Hesse-Nassau	3,110	„	„	8,921	„
„ „ Rhineland	28,327	„	„	171,816	„
Hohenzollern	380	„	„	1,357	„
Prussia	103,009	establ.	altogether	441,885	persons
Bavaria	21,252	„	„	75,222	„
Saxony	85,428	„	„	267,441	„
Wurtemberg	9,513	„	„	39,968	„
Baden	4,798	„	„	29,303	„
Hesse	1,645	„	„	3,518	„
Mecklenburg-Schwerin	1,285	„	„	1,720	„
Saxe-Weimar	2,844	„	„	8,818	„
Mecklenburg-Strelitz	250	„	„	361	„
Oldenburg	389	„	„	3,996	„
Carried over	230,418	establ.	altogether	872,232	persons

Brot. foward	230,418	establ.	altogether	872,232	persons
Brunswick	647	„	„	3,839	„
Saxe-Meiningen	730	„	„	4,194	„
Saxe-Altenburg	667	„	„	3,754	„
Saxe-Coburg-Gotha	812	„	„	1,447	„
Anhalt	287	„	„	1,302	„
Schwarzburg-Sondershausen. .	382	„	„	512	„
Schwarzburg-Rudolstadt	363	„	„	795	„
Waldeck	79	„	„	121	„
Reuss, the older	1,015	„	„	12,165	„
Reuss, the younger	843	„	„	14,147	„
Schaumburg-Lippe	495	„	„	629	„
Lippe	746	„	„	677	„
Luebeck	121	„	„	171	„
Bremen	152	„	„	1,597	„
Hamburg	566	„	„	1,991	„
Alsace-Lorraine	10,299	„	„	73,684	„
German Empire . . .	248,617	establ.	altogether	993,257	persons

The value of the textile goods produced in the German Empire in 1897 amounted, according to statistics, to 2,749·9 million marks (see table 64 pages 207/208 "German Political Economy at the end of the 19th century"). The "Annual of statistics for the German Empire" (page 85) quotes the following figures concerning the export of raw materials and manufactures in the textile and felt industries, as well as clothes from German customs territory:

	1897 million marks	1902 million marks
Sheep wool, raw	23·4	29·7
Carded wool	25·0	27·0
Wool yarn	44·6	62·5
Cloth and woollen goods not printed	144·4	159·4
Woollen hosiery not printed	23·8	22·9
Cotton yarn	21·0	31·7
Stout cotton goods, dyed, printed, &c.	62·7	81·2
Cotton hosiery	53·6	72·9
Half-silk goods, cloths, shawls	66·0	91·1

As mentioned above, Germany obtains most of its raw material partly or wholly from foreign countries. No cotton or jute is produced in Germany, the former being imported principally from the United States of America, the British East Indies, Egypt, &c., the latter from the British East Indies. Flax

and hemp are grown in Germany to a slight extent, the greater part, however, is imported, flax from Russia, Austria-Hungary, Belgium, &c. and hemp from Russia, Italy, Austria-Hungary, &c.

The production of wool in the German Empire is decreasing annually: in 1861 the number of sheep in round numbers was 28 millions, while in 1900 it had fallen to 10 millions.

Sheep breeding is principally carried on in Prussia, whilst Bavaria comes next in importance, and is followed by Mecklenburg, Würtemberg, Brunswick and Oldenburg. The enormous quantity of wool used in manufacturing in addition to the home supply comes from the Argentine Republic, British Australia, Great Britain, British South Africa, Belgium, France, &c. Carded wool and woollen yarns are also imported from Great Britain, Belgium and France.

Silk is produced in quite unimportant quantities in the German Empire: raw silk comes principally from East Asia, Italy and France, and floss silk from Switzerland and Austria-Hungary. Silk cocoons are imported from France, Italy and China.

The importance of the import of raw-materials is shown by the following figures:

	1897 million marks	1902 million marks
Cotton, raw	231·0	319·7
Flax	26·9	35·0
Hemp	23·9	23·5
Jute	21·9	35·2
Wool (also goat's hair, camel's hair, &c.)	218·7	273·9
Carded wool	32·9	53·8
Woollen yarn	99·1	86·6
Silk cocoons	0·376	0·264
Raw silk	89·5	117·7
Floss silk	20·9	27·1

Max Gürtler.

EMBROIDERY, SPACHTEL, TAMBOUR, AND LACE INDUSTRIES IN GERMANY.

The development of these industries has been of such a manifold character during the last twenty-five years that it is necessary at the outset to specify the various branches, and to state where the chief manufacturing centres are located. They are as follows:

1. Hand and Machine Embroidery and Lace Manufacture in the Saxon Vogtland, the Erzgebirge, Bavaria, Silesia and Pomerania.

2. Manufacture of Hand and Machine Point appliqué, and Tambour Lace in the Saxon Vogtland, the Erzgebirge and Wurtemberg.

3. Manufacture of Open-Work, Double Tulle Curtains and Laces in Eibenstock, Saxony.

4. Bobbin or Pillow Lace Industry in the Saxon Erzgebirge.

5. Manufacture of Guipure-Net, Point Lace and Ribbon or Insertion in Silesia, Saxon Erzgebirge and Bavaria.

6. Mechanical Lace Weaving and Bobbin-Lace Manufacture at Leipsic, Dresden and Barmen.

There are also several isolated factories in Germany, engaged in these branches of industry and producing specialties such as tapestry, embroidered flags, quilted work, &c. Berlin, the capital of the Empire, is the most notable centre for the manufacture of these specialties.

The manufacture of embroideries, point appliqué and frame lace was formerly an industry carried on at home in which the clever nimble hands of the mountain population were engaged. The modern inventions of embroidery machines, mechanical frames, lace and bobbin looms have however caused a complete revolution in the modes of manufacture, thereby increasing the wholesale production, and opening up new markets.

The introduction of machinery has had very little influence, however, on the artistic character of these manufactures, as they demand from operatives

not only mechanical skill and intelligence but a high degree of artistic talent. Art-Industrial schools have been established in all the principal manufacturing centres for training capable workers and designers. The directors and teachers in these schools endeavour not only to keep pace with the advancing spirit of the times, but to contribute essentially towards promoting the interests of this industry.

The manufacture of embroidery was introduced into the Saxon Vogtland and the Erzgebirge by Anna Nollain during the latter half of the 18th century. It was carried on as a hand industry uninterruptedly until the middle of the 19th century, and formed a profitable source of livelihood for the skilful inhabitants of the entire district.

Embroidering machines, invented by an Alsatian named Heilmann, in 1829, were first introduced into the Vogtland in 1857, causing considerable detriment to the hitherto prevailing hand industry: the flourishing machine industry however has never been able entirely to supplant hand-work.

The manufacture of elegant underwear, monograms and flat-stitch embroidery, executed in white and colours, dress-trimmings, &c., embroidered in various colours, headed passementerie, table covers and other ornamental articles, form an flourishing branch of Industry at the present time in the Vogtland and the Erzgebirge.

Great improvement in these industries, and increased capabilities on the part of the operative are due to intercourse with Bohemia and the consequent training of the inhabitants occupying the adjacent Bavarian districts in certain kinds of technical work, such as open work, guipure net, &c.

A number of Saxon manufacturers are accustomed to have certain articles embroidered in Pommerania (Stolp) and in Silesia.

Hand embroidery in Munich has attained a high reputation at the present day. Table linen, elegant underwear and tapestries are the chief articles manufactured. Munich and the Vogtland dominate the German market at the present time in these specialities. The annual sales amount to one million marks, and England, France, Austria and the United States are among the markets supplied.

Limited space prevents a detailed enumeration of the individual establishments engaged in manufacturing specialities.

The manufacture of machine-made embroidery and lace is the chief branch of industry in the Vogtland at the present time, and 9,500 embroidering machines are in operation there. Of these 3,300 are hand and 6,200 shuttle system, all principally used for making cotton and silk lace. According to statistics collected by the Plauen Chamber of Commerce for the district of Plauen and the Principalities of Reuss in 1902, there were 1,283 shuttle and 1,873 hand embroidering machines in operation. No less than 300 firms in Plauen, Vogtland, are engaged in the manufacture of lace and embroidery. Many other firms in the cities towns and villages of the Vogtland are occupied in producing coloured embroideries in velvet and silk, embroidered gloves, &c.

A revolution in the existing methods of lace and embroidery manufacture, and a consequent increase in wholesale production, the extent of which

cannot yet be calculated, will probably be caused by the recent introduction of automatic embroidering machines. At present about 200 such machines have been introduced and are at work. The construction and capability of these machines are remarkable, and the quality of lace manufactured is faultless.

The enormous proportions of the Saxon machine embroidering industry have only been attained since the introduction of tulle embroidery in 1880, the invention of the shuttle machine and the employment of the etching process which was invented about the same time. A new basis for the technical development of the industry was thus formed, which led to the establishment of a special designing school in Plauen, Vogtland in 1877. This school now bears the name "Royal Art School for Textile Industry" and gives important evidence of the artistic worth of the aforesaid invention.

Machine embroidery in the Vogtland was confined to work on firm material until 1880, when the introduction of tulle embroidery disclosed a new field wherein the intelligence of manufacturers, designers and embroiderers could be active. The embroidered tulle lace, which has attained a world-wide reputation under the name of "Saxon point," has never been removed from the list of manufactured articles in spite of the variable fashions which have prevailed. Alone, or in combination with "etched lace," recently introduced, it continually offers incitement to new and unique products of the lace industry.

Next to tulle embroidery, the so-called "etched-embroidery" forms at the present day the chief article of Vogtland industry. This is a machine-made lace, and consists of cotton or silk embroidery on material which is afterwards removed by etching, leaving only the embroidery.

This new technical process renders it possible to manufacture all kinds of lace in faultless style and workmanship.

The export of Vogtland embroideries before the introduction of lace embroidery was quite inconsiderable. It did not amount to the twentieth part of the present production. Up to 1880 the market only comprised Austria, Russia, England, Denmark and Sweden, whereas since that time France, England and America have been the chief countries importing it.

The principal centres of Point appliqué and Tambour lace manufacture are in Saxony and Würtemberg (Ravensburg, Mengen). Similarly with other sorts of embroidery and lace, they are also made by hand and machine.

Point appliqué bears the unique name "spoke-work" in Germany, after the method of manufacturing. The technical execution consists in joining embroidered or tamboured designs with spoke-like stitches, and then cutting out the ground material forming the insterstices.

Workers engaged in making Point appliqué and Tambour lace by hand chiefly produce fine articles of attire, dress trimmings, children's underwear, covers, &c. Machine work is principally used in making curtains, stores, bed-coverlets and other articles designed for ornamenting dwellings.

No reliable information can be obtained concerning the time when this branch of the industry was introduced into Germany; the inhabitants of the Saxon Erzgebirge probably learned and employed the tambour or "chain" stitch about the end of the 18th century.

Point appliqué and tambour work became an important article of merchandise after the introduction of the Cornely triple-needle sector-machine. Until then all attempts to manufacture curtains and coverlets were unsuccessful on account of foreign competition; at the present time however, this speciality has developed to such an extent in Germany that neither foreign competition nor the flourishing condition of tulle-lace manufacturing in Saxony can affect it. Its success has been due not only to the business talent of manufacturers and the progress in skilled workmanship, but pre-eminently to the artistic character of the manufactures.

According to the latest reports the sales of machine-tambour and Point appliqué curtains (frequently executed in loop stitch), bed-covers, window curtains and edging for the same, have increased considerably. The improvement in this industry, especially in the development of its fine artistic taste and in the creation of novelties, assures it a brillant future.

Besides the above mentioned appliqué and tamboured work, curtains, stores, and coverlets trimmed with ribbon and lace have become very popular lately. Germany is the chief market for this branch of industry, although considerable quantities are exported to Austria, Holland, Belgium, Sweden and Norway, England and Canada.

There are 424 firms in Vogtland and the Erzgebirge engaged in manufacturing lace, hand and machine-made embroidery, tamboured and appliqué work, and their annual production, calculated on the amount of sales, is valued at 65,000,000 marks.

The chief centre in Wurtemberg of the Tambour and appliqué industry is Ravensburg, and it has been located there since the middle of the last century. Its present importance however was attained in 1880–90 through the manufacture of fine curtains skilfully executed in the Venetian style.

It is a well-known fact that the tambour and appliqué manufactures at Wurtemberg are of excellent quality, and that they have an annual output of about a million marks.

Ten firms at Ravensburg and one at Ulm, employing from 1,500 to 2,000 female hands and 300 machines, are engaged at present in the manufacture of point appliqué curtains and coverlets. Their market includes Germany, England, the United States and South America.

The simularity between the manufacture of open-work and double tulle curtains of the Saxon Erzgebirge (Eibenstock and Schönheide) and the previously mentioned industry, consists of the tambour or chain stitch being used for both. The distinguishing characteristic, however, is the absence of all plastic affect; no material of close texture is ever used for application, such curtains, covers, lace, &c. being exclusively made by hand. This work necessitates such technical perfection that it must be classed among the most

delicate and exquisite manufactures of the Saxon textile industry. The market for these expensive lace curtains is confined almost exclusively to America, as they are scarcely known in Germany, and therefore very little used.

In spite of the competition of machine made lace, Saxon hand-made bobbin lace is an important product, being a highly valued and popular lace among certain classes of people. Several thousand female hands are consequently engaged in this industry in the Saxon Erzgebirge (Schneeberg, Schwarzenberg).

Such a continuous market exists for linen lace and insertions with twisted and plaited groundwork, strong linen corners and edging for cushions, coverlets and scarfs, Torchon lace, Torchon and Guipure handkerchiefs and table covers, tablecloths and curtains, &c., that frequently the demand can scarcely be met. There are 28 schools in Saxony, whose aim is to instruct women in the art of making bobbin lace. In 1896 these schools registered 1,329 women and 36 men as pupils; in 1897, 1,380 women and 23 men; in 1898, 1,391 women and 16 men; in 1899, 1,381 women; in 1900, 1,335 women; in 1901, 1,326 women, and in 1902, 1,355 women.

In addition to these schools for bobbin lace, there is a school for Lace Designing at Schneeberg. Only such pupils are admitted there as have passed through the ordinary bobbin lace schools. The pupils are taught to make the most artistic patterns of Torchon, Guipure, Cluny, Idria, Malines, Chantilly, Brussels, Mechlin, Duchesse, Valenciennes, and various kinds of point and coloured lace, and the school has established agencies with sample rooms at Dresden, Berlin, Edinburgh, and recently at Schneeberg.

Since the introduction of point-lace and guipure net into Silesia, the Silesian lace industry has developed into a profitable means of livelihood for the inhabitants. During the winter season especially, it is carried on as a domestic industry, and gives employment at the present day to about 1,500 women living in the districts lying along the Austrian frontier.

The most recent industry established in Germany is the mechanical manufacture of woven and bobbin lace at Leipsic, Dresden, and Barmen. It originated in England, and great difficulties were experienced at first in operating the extremely complicated weaving and bobbin machines and in dressing the lace, so that several years elapsed before the enterprise became profitable. The manufacturers at the present time are confined to laces easily made, which can compete in the German market with Nottingham and Calais wares, viz., trimmings for underwear, Tatting, Torchon and Valenciennes lace.

The unique and tasteful patterns, produced recently by German mechanical factories of woven and bobbin lace, have become quite popular.

At Leipsic there are 51 lace weaving machines in operation. One machine, working 12 hours daily, produces annually lace valued at 30–40,000 marks.

Curtain machines are employed for manufacturing certain kinds of lace, used for decorative purposes, such as church ornamentation, &c.

At Barmen, lace is manufactured on the ribbon loom (ribbon-loom-lace), and on machines with belt-gear (plaited or bobbin lace); only a few years have elapsed since lace weaving machines were introduced. The establishments

in Barmen are not confined to lace, but include the manufacture of ribbon, tapes, braid, &c. No reliable information can be obtained concerning the amount of production. Recent statistics show that there are about 5,000 ribbon looms, 120 belt-driven machines, 50,000 plaiting machines, 100,000 rollers and 3 million bobbins at work at Barmen and in the neighbourhood.

If the fashions are favourable, the majority of the looms and belt machines are employed for the manufacture of lace. There are about 7–8,000 workmen engaged in this work, and wages approximate 8,000,000 marks annually.

In the German Empire there are 21,660 establishments engaged in the manufacture of lace and embroidery (including crochet work); of these 15,277 belong to the domestic Industry; 43,674 persons (12,113 men and 31,561 women) are engaged in these branches of industry, including foremen.

The amount of lace and embroidery exported in 1902 was as follows: cotton lace 30,223,000 marks, cotton embroidery 25,162,000 marks, embroidery on linen 344,000 marks, thread lace (made with bobbin or needle) 235,000 marks, blond lace (silk or half silk with metal threads) 323,000 marks, blond lace and embroidery (silk or partly silk without metal threads) 2,563,000 marks, woolen lace and tulle (embroidery on woolen materials) 1,236,000 marks; total amount 60,086,000 marks.

Prof. R. Hofmann.

MACHINERY.

Untiring activity in the field of industrial technology on the one hand and research and classification in all branches of natural science on the other, have paved the way to the perception that the objects of the outer world do not owe their existence to the caprice of fortune nor to blind chance, but that the production of the very simplest article, natural or artificial, requires a sequence of circumstances and effects, which owing to its similarity in the most various domains has been recognized as a universal principle, viz., the principle of evolution. In technology this principle is self-evident; it follows from the conception of work, and from the fact that bodies can only change their position or form through work. In machine construction the principle has long been recognized that for every new form to be produced new forms of tools are also necessary, as well as new machines to work such tools. Owing to the record-breaking discoveries of the great inventors of the last century, and the development of a science of technology, the connection has been found between natural and artificial products, for it has been shown that both sorts of development are regulated by the principle of adaptation. The unconscious effect of the forces of nature and the conscious activity of mankind work according to the same great uniform principle of gradual evolution and adaptation to all aims or conditions. □

□ Were it possible to produce a perfectly complete international exhibition upon this basis, we should have indeed a picture of human activity such as it would be impossible to improve upon. Since however at every exhibition the wishes and views of the individual exhibitors have to be taken into account, and since these exhibitors will be sure to chose those of their manufactures and products for exhibition which they consider best suit their own interests, it is scarcely probable that such a goal will ever be reached. The country where the exhibition is held is in the best position to offer a complete representation of its sciences, industries, and technology by its exhibits, for it suffers least from the difficulty in making proper arrangements, and in transporting and arranging its exhibits. Foreign countries, particularly European ones, will only

be able to show a few examples of their industrial and technical capabilities at so remote a spot as St. Louis, and must therefore have recourse to supplementing and explaining their exhibits by words, pictures, or figures.

It is the object of the present treatise to point out the characteristic features of the development of German machine construction, and to show the present condition thereof.

The purpose of all machines and engines is without exception the performance of work capable of being put to industrial uses. Work is performed when a force acts along a given direction; scientifically expressed work is the product of work and direction. These two factors of the conception of work, force and direction, or better, force and motion, correspond to the known division of all engines into generating machines and working machines, and to the direction of the perfection of both classes.

In generating engines the forces of natures, such as heat, water power, or wind, are forced into certain paths; their task is the production of work, of kinetic energy, in directions already determined, or, in other words, the transformation of the energy present in nature to the purposes of industry.

The purpose of working machines is to utilise the energy which has thus been induced to follow certain fixed directions for the production of industrially useful and saleable products.

The standard for judging generating engines is, according to the general view, their effective power. This standard is, however, a one-sided one, for no less importance should be attached to the reliability of their working, which is essentially determined by rational construction, by clever arrangement of the working parts and distribution of the moving masses, by the capability of the whole engine to resist inner or outer influences, by the judicious structure of the whole to make the operator's work lighter, by employing forms suited to the working forces, and by observing all the physical conditions necessary for the permanent running of the engine. The economical standard of a power plant is not the same for all countries, at all times and under all circumstances. In Germany much importance is attached to securing a high degree of economy, because economy has to be exercised in the utilisation of the quantity of energy present in nature. Consequently in power engines of German origin all the above-mentioned considerations are strictly observed.

A high degree of effective power is aimed at in steam-engine plants, for example, both by employing perfect heating arrangements and good steam boilers capable of absorbing the heat, and also by thoughtful construction of the whole engine. Safety in construction is apparent in the forms and proportions of the separate parts of the engine, and certainty of movement from the accuracy of the working parts; adaptation to working forces and harmful resistance, depends upon the forms and relation to one another of the bearing-linings, slide-faces connecting rods and the like; complete using up of the steam generated and consideration of the dynamic forces depends upon the compound system now almost exclusively employed. Engines are adapted to the most varied industrial purposes by suiting them to the number of

revolutions of the working machine, or to the working of the masses to be set or maintained in motion.

The marine engine of many thousand horse-power, which, on their rocking base, transmit their whole force to the propeller shaft day after day without interruption only became possible through the perfecting of the engine in working and constructive respects, as well as though improved methods of manufacture. The perfection of the marine engine is to a certain extent a standard for the degree of excellence attained; marine engines with balanced movements (Schlick's patent) give German vessels a speed hitherto unexcelled.

The properties of steam as a motive force are met by the concentrating, or in other words the enlarging of the power producing plant. Large boilers mean a higher economic working effect. Large steam cylinders incur considerably less loss by condensation than smaller ones. The compound system necessitates the use of high-pressure steam as well as of larger steam cylinders. All these requirements come to a head in the ever increasing demand for power in marine engines of unusual size. Steam engines of three, four or five thousand horse power for use on land, are employed for the production of power in electric generating stations, mills, spinning and weaving factories, rolling mills and so forth. The largest land engine, of 7,000 H.P. was turned out only last year by the "Görlitz Maschinenbau-Aktiengesellschaft" for a Berlin generating station of the "Allgemeine Elektrizitäts-Gesellschaft." The high standard reached in the science of steam engines in general is proved not only by the work of the company just named, but also by those of such concerns as the "Vereinigten Maschinenfabriken Augsburg-Nürnberg," Messrs. Borsig in Berlin, the "Berliner Maschinenbau-Aktiengesellschaft vorm. Schwartzkopff" at Berlin, Richard Hartmann at Chemnitz, Egestorff at Hanover, Luther at Brunswick, Haniel & Lueg at Düsseldorf and many others.

The steamers built by the "Stettin Maschinenbau-Aktiengesellschaft Vulkan" are known all over the world. On the ships of these yards, which were only established in 1857, 261 vessels have been built, 66 of which were large or small men-of-war, 146 screw propelled steamers for the merchant navy, and 49 paddle steamers of various sorts. Of the larger steamers we will only mention the "Kaiser Wilhelm der Grosse" with a gross tonnage of 14,349, the "Kronprinz Wilhelm" with 14,908, and the "Kaiser Wilhelm II." with 19,360. The express steamer "Kaiser Wilhelm II.", with a length of 706'6", a breadth of 72' and a depth, to the lower promenade deck, of 52'6", is one of the largest vessels at present afloat. The engines are of 42,000 H.P., and their displacement, when laden, 2,600 tons. The vessels turned out by other yards, such as the "Germania Werft," and Messrs. Howaldt at Kiel, Blohm & Voss at Hamburg, Kaiserstieg at Hamburg, and others, are also known all over the world; they one and all point to the high standard attained not only in naval construction, but also in engine construction in Germany, for each of these huge vessels constitute nothing else than a complete engine-works in itself.

From the recognition of the fact that but a small total effective working force (about 12–15 per cent) can be obtained by employing steam as the medium

in motors, and owing to the demand for small motors of other sorts, the construction of gas engines, with which the famous name of Dr. Otto will always be connected, has been developed. These engines formed the model for petroleum engines, and particularly for the benzine motors which have lately come so much into use for motor cars.

As far as the technology of heat is concerned, this form of motor shows a rise in working effect, for even in comparatively small engines, about 15–20 per cent of the heat contained in the gas or petroleum is turned to account. For certain purposes, such as small works, they possess the advantage of economising space, since they require neither boiler nor chimney.

Great attention is constantly being paid to the degree of effectiveness in these engines. In the Diesel motor as much as 28 per cent of the heat supplied is converted into effective work, and 40 per cent into indicated work.

At first gas engines served for driving small machines, &c. Their development during the first decades is marked by machines of 5, 10 and 15 H.P.; in the eighties engineers began building gas-motors of several hundred H.P.; and towards the middle of the nineties the first gas-engine was built on v. Oechelhäuser's duplex system, having about 600 H.P. The great success which attended this engine, owing to its utilising the waste gases from smelting furnaces, resulted in a stride in the increase of the size of the motors which had never been anticipated. At the end of last century the capacity of such motors had risen to 1,000 H.P., and they have now been brought to suit all requirements in the larger mining works; motors of two, three and four thousand H.P. are already at work, and others are in course of construction. There are essentially three different systems of these engines, the Deutzer quadruplex, the Oechelhäuser duplex and Körting's single system. During the short course of development which all these large engines have taken, far more than 200,000 H.P. have served for the production of power. In addition to the firms named above, we must also mention the "Nuremberg Maschinenbau-Aktiengesellschaft," Messrs. Borsig, Haniel & Lueg, Benz of Mannheim, and others.

The reason for this remarkable increase in the construction of gas engines lies in their better utilisation of fuel and the consequent cheapening of the production of power. The unit of effectiveness costs in a gas engine less than a half or a third of what it does in a steam engine.

As driving gas for larger engines, ordinary illuminating gas is not employed, but either so-called high-pressure gas, Dawson-Gas, or else suction gas, for the production of which latter the works of the German firm Julius Pintsch have bekome pioneers. These suction gas plants enjoy special popularity in Germany because they require little attention, and do not necessitate the assistance of a licensed steam boiler for working. Such plants can be put up in any suitable spot, and in Berlin, for example, they are placed in the basement or on the ground floor of some of the larger hotels in the immediate neighbourhood of the reception rooms, without the guests noticing the presence of an engine in any way. This circumstance means, moreover, that gas engines

are effecting a decentralisation of generating stations, which at the same time places a limit to the excessive increase in the net-work of cables for electric mains.

The other side of the conception of work, viz. the movement, the constantly repeated action of the tool and the article worked upon, which is the fundamental requirement for the conversion of the latter into commercially useful products, is evident in working machines of every kind. In the perfection of the working machine many branches of industry in Germany have had their share. The aim throughout is to introduce automatic action in the construction of machines as far as possible. This occurs in the manufacture of many wholesale articles where similarity of all products manufactured by one and the same machine is required.

Although machine construction is of an international character, yet the views of the constructors and the habits of the operators, as well as the surroundings of the machine, result in a type peculiar to the country where the machines in question originate.

The machines for the working of iron and wood in Germany, have, it is true, some similarity to those of other countries; nevertheless not a few peculiarities have arisen, particularly owing to the tools used, the fashioning, the application of safety appliances, the enclosure of automatically acting machines, and the customs and social position of the operators. In Germany a tendency is becoming more and more prevalent to enclose the working portions and tool-parts of the machine, partly for the protection of the machine itself, and partly for the protection of the operator; this of course is done without impairing the capabilities of the machine.

The recognition of the fact that in a machine enclosed and dependent only upon itself, the increase of the speed of working depends only upon reliability of construction, has had a great influence upon the exact perfection of the machine with regard to the forces and friction occurring therein. This is not only true of those machines which consist of rigid bodies, but it extends to pumps, compressors and the like. In this respect also the increase of the working speed has made great strides.

Following the general tendency of the times in all industries, all mechanical work, which does not require high intelligence is being gradually taken out of the hands of the operator and relegated to machinery. In the textile and paper making industries, in the book-printing industry, and in the manufacture of flour, cement, &c., this principle has been brought to completion, and other manufacturing operations are following. The metal industry, the production of articles of food, the pottery and brick making industries and others as well, are continually making further progress in the employment of machines for saving work and power.

It is impossible within the bounds of a short introduction to do justice to the importance of the industry of machine and engine construction in every respect. The present condition can, however, be demonstrated and supplemented by some statistics of the exportation of German machines and engines.

According to the "Statistical annual for the German Empire," the exportation of German machines and engines has been as follows:

	1900		1901		1902	
	dz (=100 kg)	Value in thousands of marks	dz (=100 kg)	Value in thousands of marks	dz (=100 kg)	Value in thousands of marks
Locomotives (locomotors and traction engines)	122,926	15,716	183,204	21,068	197,368	20,500
Steam boilers, with and without tubes, steam engines, turbines, pumps, ventilator-fans for factories, blast engines, rolling machines, steam hammers	414,136	32,713	334,772	24,650	440,917	29,758
Machine tools, transmissions, machines for cutting and punching metal, lifting engines	165,259	13,511	154,104	11,486	388,689	26,000
Carding engines and cards, cotton spinning machinery, looms, machines for wood pulp and paper making, machinery for treating wool	213,493	19,928	182,526	15,505	224,826	17,297
Agricultural machinery, brewing and distilling machinery, grinding machinery	216,716	22,585	196,627	17,495	225,919	19,298
Electric motors	129,178	23,252	124,596	19,935	134,498	21,520
Sewing machines, &c.	75,721	7,572	77,025	7,703	80,554	8,861
Machines for various industrial purposes	1,007,748	80,620	873,089	65,482	480,788	33,655

Wilhelm Hartmann.

ELECTROTECHNICS.

If we pass the great technical achievements of the last century in review, our gaze is arrested by the latest and most stupendous conquest made by man, that of Electrotechnics, which, based on exact science, first developed in the application of weak currents.

In 1833, Gauss and Weber constructed the first telegraphic plant in the world which connected the Observatory at Gœttingen with the Physical Laboratory. Prof. Steinheil of Munich shortly afterwards improved the telegraph, being the first to use the earth as a return circuit.

The discovery of electro-deposition by Jacobi occurred at the same period. In placing the date of the birth of electrical-engineering in the same year as that of the first practical use of the electric current, it is clear that what is now-a-days understood by the term electrotechnics could by no means have grown from such beginnings only. The connecting link between electricity and engineering was missing. The means of obtaining great working power from electricity was unknown, in short, the way to connect electricity with mechanical engineering was still a question of the future.

No practical use of the arc light, invented by Davy in 1810, or of the electro motor, constructed by Dal Negro in 1834, could be made as long as this gap existed. In 1866 however, Werner Siemens established the dynamo-electrical principle, and thus found the missing link. By constructing the first dynamo he gave rise to the possibility of generating a large quantity of electrical energy in a cheap and simple way.

Engineering thus obtained a new form of energy as a working power, we may say energy in an improved and more versatile condition, which, owing to its cleanliness and easy manipulation, soon made its way and took possession of a large field of operations.

Werner Siemens can therefore be called the parent of strong-current technology. He occupied himself at an early date with the study of Jacobi's invention of precipitating copper from a solution of cupric sulphate, and hit upon the invention of gold and silver electroplating. It is well known that we have him to thank for many improvements in telegraphy, especially

in the submarine branch. It was he who introduced the condenser for use in submarine telegraphy and who laid the cable between Sardinia and Algiers. His theories on cable laying have been considered as fundamental ever since that time. His name is closely connected with researches on purely scientific subjects, and stimulated in his work by his intimacy with Helmholtz, du Bois-Reymond, Clausius and Wiedemann, he became the author of many scientific improvements of which the most important and fertile was the introduction of the mercury unit for electrical resistance, called after him. Science further owes a number of important measuring instruments to him, several of which are still in use although their forms have been somewhat altered.

His business relations with Halske, a mechanic, led in 1847 to the establishment of the world-famed firm of Siemens & Halske. Their first venture was the construction of telegraphic apparatus, and they put up one of the first telegraph wires in Europe, that from Berlin to Frankfort.

Dynamo machines could only be used for electric light on a limited scale, as in spite of the improvement of the ring armature invented by Zenibe Gramme, a Belgian, no one knew how several arc lamps could be fed from a single circuit, or how to "divide" electric light, as it was termed. When regulating one lamp the others were sure to be affected, or a separate machine had to be worked for each light. Jablochkow practically solved the problem, preventing the movement of the carbons towards each other by fixing them side by side.

Through the invention of incandescent lamps, shortly afterwards made by Edison, and the simultaneous first use of a parallel arrangement, whereby every lamp was independent of the others, in contra-distinction to the series connection, electric light was suddenly turned into a formidable rival of gas light.

It was Edison again who furnished the "Columbia" in 1879 with a parallel arrangement plant for 115 incandescent burners. In the following year he built the first municipal central station for electric light in New York, which even at that time presented all the characteristics of a large central station of the present day. We owe to him and Hopkinson the invention of the three-wire system, which allows a much greater distance to be traversed without any increase of tension. This system was, however, not efficient for carrying the current over very long distances, nor for supplying very large districts. With the knowledge that the costs of distribution are diminished by increase of tension, the transmission of alternating currents at a high tension was essayed. As however the consumption tension is dependent on the lamps, it was found advisable to reduce it to a simple current before delivering it to the consumer. The first to come forward with a practical arrangement for this purpose was Lucien Gaulard, who used an induction coil; there were, however, a great many drawbacks to this system, which were only removed in 1885 by the distributing system of the engineers Zipernowsky, Dery and Blathy, and by the introduction of their poleless transformers. The new system was exhibited at the "Landesausstellung" in Budapest,

and with it the alternating current machine, which had fallen into disuse, came into favour again.

The use of the three-wire system with continuous currents led to the invention of the multiphase system for alternating currents by Tesla and Ferraris. The three-phase, or rotatory current, is the most common form of this, and has been adopted by nearly all larger German firms.

Germany and the diligence of German engineers have contributed considerably to the further development of electrical engineering.

The constructive deficiencies of the ring-armature invented by Gramme, which proved unsuitable for the generation of any particularly strong currents, were removed by von Hefner-Alteneck, at that time chief engineer to Messrs. Siemens & Halske, through the invention of the drum armature. This he brought out at the Berlin Industrial Exhibition in 1879, together with a differential lamp, a practical and useful arc lamp which for the first time allowed of several lamps being joined up in series. The firm of Siemens & Halske created a great sensation at this same exhibition by the first electric railway.

In 1881 Edison's representative introduced the first incandescent lamp at the Paris Exhibition. The question whether the divisibility of electric light into the smallest units was of any value was a matter of great dispute at that time. A German engineer named E. Rathenau, recognising the importance of the incandescent lamp, secured the Edison patent for Germany, and founded the German Edison Company for applied electricity. Almost simultaneously he undertook to provide Berlin with electric power, and erected a plant which became a model for the construction and working of other central stations, the practicability and lucrativeness of electrical works on a large scale having thus been demonstrated.

The manner in which the General Electric Company (Allgemeine Elektrizitätsgesellschaft) originated from the original Edison Co. is now a matter of history, and how it developed under Rathenau's management and yielded such important results in the domain of strong current technology is well known. In 1882 the Company had the opportunity of showing the German public this new light at the Munich exhibition. This was an important exhibition, made specially interesting by the fact that it was there that the French engineer Marcel Deprez made a first attempt to transmit electricity over a distance of 60 kms. Although this experiment was considered a failure from a technical point of view, the efficiency of the transmission being only 25 per cent, it still had an encouraging effect on the development of electrical transmission of power, and shortly afterwards Brown, the head engineer of a machine factory at Oerlikon, in Switzerland, effected a transmission of 50 H.P. between Kriegsstetten and Solothurn, a distance of 7·5 kms, with a total efficiency of 75 per cent. The electrical transmission of power was, however, not definitively adopted as a working factor in engineering until the Frankfort Exhibition of 1891, when Brown, together with von Dolivo-Dobrowolsky, the chief electrician of the Allgemeine Elektrizitätsgesellschaft, were brilliantly

successful in transmitting power from Laufen to Frankfort-on-the-Main, a distance of 75 kms; this performance resulted in the usual methods of transmission of power till then employed being very speedily abandoned.

Electricity has gone on developing in every direction, even the invention of Auer's incandescent gas light helping more than hindering its victorious progress by increasing the taste for brilliant illumination amongst the general public. Attempts have been made to secure the advantages of the Auergas-light for electric lighting, and it is evident that the solution of this problem would result in a powerful impetus to electric lighting.

At present Germany supplies more than half the electric incandescent lamps used in Europe, and exports her electrical manufactures to all parts of the world, with the sole exception of the North American market which is closed to her by customs barriers. The efficiency of the carbon thread glowing in vacuums seems, however, to have reached a limit, for since the introduction of the „Flashing" it hardly seems to have altered either in shape or capacities.

Great progress was made from an economical point of view by the employment of Professor Nernst's Electrolyt lamp, in which rare earths are used, and which has been handled in such a practical manner that the Allgemeine Elektrizitätsgesellschaft has already disposed of two million of them. This ingenious lamp, in which a secondary conductor diffuses light after having been heated, saves about 50 per cent of electrical power, and can be used for lights of 35 to 250 candle power. Although these lamps will not, as far as can be seen, oust either the incandescent or arc lamp, yet they form a very useful link between the two.

Professor Auer von Welsbach, who has contributed so greatly towards the success of the incandescent gas light industry, has also constructed a lamp which sheds its light by means of an osmium thread arranged in vacuum, and is very economical, but only made up to the present for low tension currents.

The greatest progress has, however, been made by electro-technics in regard to their application to street railways, where they seem likely to supplant all other systems. In this sphere of activity the German electric industry is also very much to the fore. The number of towns supplied with electric railways was: at the end of 1891, 3; 1892, 5; 1893, 11; 1894, 19; 1895, 32; on the 1st of August 1896, 42; 1st September 1897, 56; 1st September 1898, 68; 1st September 1899, 88; 1st September 1900, 99; 1st October 1901, 113; 1st October 1902, 125. The increase of railways as compared to 1901 amounts to 10·6 per cent.

The electric railways in running order in Germany on the 1st October 1902 totalled: whole length of line 3,388·48 kms; whole length of rails, 5,151·50 kms; number of motor cars, 12,352; number of supplementary ordinary cars, 7,967; whilst further tracks of a length of 362·49 kms with rails to the length of 386·30 kms were in course of construction. The total power used by the electric railways was—exclusive of accumulators—122,076 kilowatts. The accumulators represented a power of 30,052·5 kilowatts, so that the total amount of working power in dynamos and batteries for street railway pur-

poses amounted to 152,128 kilowatts, or an increase of 24·7 per cent as compared to 1901.

The excellent results obtained by the Experimental Company for Swift Railways with the two swift railway cars constructed by Messrs. Siemens & Halske and the Allgemeine Elektrizitätsgesellschaft on the trial track between Marienfelde and Zossen, have become generally known through the daily press. They excite the astonishment of novices by the immense speed attained, and the recognition of experts by their safety and reliability in working and by their ingenious and simple construction. The speeds attained (210 kms per hour) are nearly twice as high as that of the fastest trains. The trials have demonstrated that such speeds cannot only be reached, but that the vehicles run much smoother and more reliably than at lower velocities. The work of the Experimental Company has thus supplied invaluable data for the practical solution of the important question of employing swift electric plant for public traffic; in this way it has been possible to cope with the problem of placing swift railways on an economical basis.

The development of German electric works has been perhaps even more marked, although it must be recognised that it has some what abated lately as compared to the years 1898—1900. One can fairly assert that there are hardly any towns of over 30,000 inhabitants in Germany that cannot boast of electric lighting. The dropping off in the increase of new works is not to be traced to any decrease in the efficiency of electrotechnology, but principally to the fact that the supply has to a great extent already been met.

The number of new electric works opened was: up to the end of 1888, 15; in 1889, 7; in 1890, 8; in 1891, 13; in 1892, 22; in 1893, 31; in 1894, 36; in 1895, 61; in 1896, 70; in 1897, 101; in 1898, 148; in 1899, 135; in 1900, 129; in 1901, 72; up to April 1st 1902, 14; not mentioned 8; total 870. The works are distributed in 843 townships, and 69 are either in course of construction, or their construction has been resolved on. The following table shows the alteration in the number of works and their supply in 1901 and 1902.

System	Number of works		Capacity of machines in kilowatts		Total capacity of machines and accumulators in kilowatts	
	1901	1902	1901	1902	1901	1902
Continuous current with accumulators	600	684	122,367·7	150,499·7	168,314·0	208,748·3
Continuous current without accumulators	24	25	4,634·7	6,154·2	4,634·7	6,154·2
Alternating current (one and two-phase)	44	45	27,547·5	30,483·5	27,547·5	30,543·5
Rotatory current	45	52	40,759·0	75,925·0	41,634·0	77,756·0
Rotatory and continuous currents	43	50	86,985·1	86,614·5	102,510·9	106,559·3
Alternating and continuous current	10	12	6,874·0	7,476·0	6,979·0	8,041·0
Monocycle generators . .	—	2	—	—	—	970·0

The electric machines in the electric works—exclusive of accumulators—can produce 357,992·9 kilowatts; in addition to this there are accumulators with a capacity of 80,779·4 kilowatts, so that machines and accumulators capable of supplying a total of 438,772·3 kilowatts annually were employed by the 870 electric works in Germany during 1902.

The following summary shows the motive power used in the electric works.

Working power	Number of works	Total work done in kilowatts
Steam	509	282,363·1
Water	84	24,146·1
Gas	52	4,790·3
Electricity (from another works)	4	256
Wind	1	220
Mixed systems:		
Water and steam (one or the other partly in reserve)	193	40,493·1
Water and gas (one or the other partly in reserve)	7	639·6
Steam and gas (one or the other partly in reserve)	4	2,143
Water and benzine motor	6	242·7
Water, steam and gas	1	96
Electricity and steam (the first from another works)	4	1,953
Electricity and water (the first from another works)	2	150
Not given	3	500
Total . . .	870	357,992·9

According to this over 58·6 per cent of the works employ only steam, and the work done by their machines amounts to 79 per cent of the total work done by the machines of all the works. The whole of the electric works fed 4,200,203 incandescent lamps, 84,891 arc lamps, and 192,059 electric motors. Reduced to Watt incandescent lamps, the total supply amounted to 8,506,175 normal lamps or 425,308·75 kilowatts.

Of late years the use of electricity for chemical purposes has rapidly gained ground, owing to the increased utilisation of water power facilitated by electrical engineering The manufacture of aluminium at a cheap cost price was made feasible by the use of the electric current. It is likewise used for the extraction of copper, gold and nickel from the ores, for the production of caustic soda and potash, and especially for the manufacture of calcium carbide, for which there has recently been an increased demand.

The increasing use of electricity in every direction has given a powerful impetus to electrical engineering, and this again has re-acted on the already existing industries. In Germany for instance, more than half the steam engines and turbines turned out are used for driving dynamos.

The construction of steam engines has undergone a great change with regard to revolutions, precision of regulation, &c., by the requirements of electrical engineering, particularly those of the alternating current system. In other industrial branches also electricity acts as a stimulus, offering new problems, in the solution of which German engineering takes a prominent part. In fact it stands first in Europe, and is by no means behind the great American industry with respect either to working capacity or the quality of its productions.

There are 80 electrical engineering companies in Germany, with a total capital of 520 millions of marks, of which about 250 millions belong to manufacturing companies, and about 270 millions are invested in companies for financing and operating plants.

These companies carry out orders for 300 millions of marks annually, most of which come from abroad, as the requirements in Germany alone would of course not nearly amount to that sum.

The theory of waves established by the late lamented Professor Hertz has, as is well known, been made use of as wireless telegraphy for transatlantic communications, and in the army and navy much has been accomplished in this direction, the German Professors Slaby and Braun sharing with the Italian Marconi the merits of having elaborated this important discovery. The system has been made use of by Messrs. Siemens & Halske and the Allgemeine Elektrizitätsgesellschaft, and has been employed also by the government of the United States for many stations on the coast.

If we inquire how German electrical engineering came to gain such a leading position in the world's market in such a short space of time, we discover as the principal cause the thorough scientific training of the German engineer. In the works of the above named firms there are about 1,950 engineers, who have received their training at Technical high schools in addition to numerous technical experts. Of these 340, or 17 per cent, are directors or chief engineers; about 5 per cent are employed in the laboratories for testing machines and apparatus, for examining new inventions, testing and material; about 3 per cent are engaged in the calculation of machinery, apparatus, resistances and windings; about 19 per cent are occupied with the construction of machines, apparatus, switchboards, and railway appliances; about 4 per cent in the actual manufacturing, as heads of the workshops, or as managers of the works; about 5 per cent as managers of central light stations; about 9 per cent as superintendents of electrical installations; about 54 per cent are engaged in computing plans and estimates for central stations, transmissions of power, and railways; of these 33 per cent act as representatives of their firms abroad, and 21 per cent are working at home; 1 per cent take over the literary part, such as publications, statistics, and the preparation of catalogues.

From this list it is evident that a division of labour has been carried out even in the intellectual part of electrical engineering; a similar process has been accomplished in the technical high schools where nowadays a great

many lectures are held upon the different branches of electrical engineering and large laboratories suitable for practical work are fitted up, whereas formerly the entire teaching consisted of theoretical courses and a few lecture-room experiments.

The training of the German engineer keeps pace with the development of electro-technical science itself, and thus the conditions are fulfilled for enabling the German electrical engineer to successfully retain the prominent position he has reached by his industry and perseverance.

G. Klingenberg.

MOTOR CARS.

To the first half of the nineteenth century belongs the birth and perfection of the railway; within that period and the course of the few decades immediately following, the travelling public, while gaining an increase in speed which enabled them to set time and distance more or less at naught, became gradually accustomed to the unavoidable restrictions which the new order of things imposed. During the latter half of the century, the growth of the cycle and motor-car industry and the state of development which it has since reached, have made the traveller once more independent of the permanent way, while at the same time leaving him all the advantages of rapid transit.

Cycle and motor-car are inseparable from the highways: the better these are, the lighter the tax on wheel and frame, and the less the driving-power required. As a fair test of the strength of construction, therefore, we must select rather the worst than the best surfaces which the vehicle will be required to traverse, and at the same time the maximum dead carrying weight must be taken into consideration.

Fruitless experiments in the way of locomotive carriages can be traced back as far as to Newton. Leaving these on one side, the new motor-car industry has found its origin principally in Germany, though it must be admitted that other countries, and especially France, have done much towards shaping the public mind to receive the new idea, as also in determining the

present form of construction, and in adapting the new vehicle to particular purposes. Among other firms, Messrs. Daimler & Co. and Messrs. Benz & Co. of Mannheim are known for their successful productions.

The previously existing factor which determined the pattern of the wheels and frame of the modern motor-car, was the cycle, as the ordinary horse-car formed the carriage itself, and the railway engine suggested the driving principle. The motor-car then, is a combination of these three elements, viz., the wheels, frame and steering gear of the cycle, the body of the coach or railway-car, and the driving machinery of the locomotive. Perhaps the most surprising result is, that in spite of the short time of development, this extraordinary combination of three distinct elements has established new standard patterns of its own, though its adaptation to widely different uses has considerably divided the types, and will continue to divide them still further.

Among the various other parts of the waggon—wheels, frame, steering gear, and brakes,—the most important of all are the motors. These may so far be classified according to four different systems: 1. Benzine motors, 2. Motors with steam engines and boiler, 3. Electric motors with accumulator, 4. Combination motors; i. e. benzine motors with electric motors and accumulators. Electrically driven motors have the advantage of greater mechanical simplicity in those parts which have to do with the variation of speed, the reversing motion, and the steering-gear; they have however the disadvantage of carrying a heavy dead-weight in the accumulators, and another in the fact that the machine does not generate its own power, but is dependent on central electric stations for its supplies.

The benzine motor is more independent than the electric. Although the small motors used have no great power, the direct use of benzine is nevertheless cheaper than the complicated process necessary to turn the latent energy of coal into electricity by means of steam engine, boiler and dynamo, unless one presupposes the existence of large and frequent generating stations for the purpose. Benzine, too, is an article of commerce which can be had anywhere; and in this, the benzine car has the very great advantage of being absolutely independent of any central sources of supply.

As a counterbalancing disadvantage, the benzine motor is greatly handicapped by the complexity of its construction. The driver of such a car must have a perfect acquaintance not only with the steering wheel and brake, but with the reversing and change-speed gears, and with the motor itself. He has a large number of handles and levers to attend to, and has to control the action of the motor at the same time. The car, moreover, carries special apparatus for ignition and cooling, which taken with the rest, makes the whole mechanism a complex system of interrelated parts, which it is necessary to study and understand before venturing to use. Nevertheless this type of car seems destined to take the precedence.

The combination of benzine and electric motors has this very decided advantage, that the complicated change-speed and reversing motions of the former can be thrown out of gear when required, by replacing the benzine

motor with the electric; the latter can also be used in crowded throughfares, thus enabling the car to be run in greater comfort by avoiding the unpleasant noise of the ignition explosions, and the smell of the exhaust gas. Once clear of the town, the benzine motor can again be brought into play, either alone or in combination with the electric one: the accumulators can be charged on downward gradients or on good roads which require but little driving power. Such a car has a motor which is complete in itself as well as a secondary motor, and is therefore a power-station on a small scale. Compared with the other two systems already described, this class of car has made comparatively but little progress.

The steam-car, in addition to its engine, carries of course its own boiler, which, on account of the limited space and the large heating-surface necessary, can be nothing more than a water-tube-boiler, a type of steam-generator which requires special attention, as, having no reserve steam (the evaporation being only of the amount actually required by the engine), the water must be continually renewed from the supply tank. The driver of a steam-car has therefore to keep his eye on the heating apparatus as well as on the water.

Handicapped as the steam-car is in comparison with the other kinds, it gains again in being able to dispense with all the complicated arrangements of the benzine car for driving, change-speed, and reverse motion, for its great advantage is that it carries the equivalents of all these in the machine itself. It is however at a considerable disadvantage in the uneconomical application of heat to raise water to the temperature required for the necessary steam pressure, the consumption of fuel being proportionately higher than in the case of explosively propelled cars.

Of these four different systems, the one which has chiefly developed in Germany is the benzine motor. The leading firms, among which the "Daimler-Motoren-Gesellschaft" of Cannstatt, and Messrs. Benz & Co of Mannheim are the oldest and most noteworthy, have contributed much to their improvement; and, so far as the mechanical part is concerned, have by their enterprise and progress brought their cars into a prominent place on the European market.

The advance of the motor car towards perfection shows steady progress: the secondary parts, particularly the valve gear, have gradually attained the complete finish of the steam-engine. The accessory parts of the older types of motor, which often required the additional help of springs or weights to regulate their movements, have in the modern types been brought completely under control. The fuel supply has also been regulated by contrivances, partly automatic, partly governed from the driver's seat.

Another most important point for consideration, is the way in which the driving power is transmitted from motor to axle. This is accomplished by means of carefully adjusted shafts of a strength calculated to suit the kind of road the car is built for. Change-speed and reversing gear are so arranged as to operate smoothly and to be easily managed by the driver. The parts belonging to the steering gear are all brought together within

reach of the driver's seat, and are combined with the rest of the apparatus for starting and stopping the car in such a way as to assure perfect certainty under all conditions of working.

The frame, the rigidity of which is of the greatest importance, is constructed of U-shaped wrought iron longitudinal framing-pieces so connected as to be as firm as that of a railway carriage which it in some way resembles, though naturally the purpose which it is to serve points to another form of construction. Axles and wheels, of steel or wood, or of both have been perfected through repeated experiment.

The stability of the car is best increased by keeping the centre of gravity as low between the wheels as possible. The lubrication of the frictional parts is so concentrated as to be easily supervised and controlled from the driver's seat. The working out of all details, especially of the bearings (which, wherever practicable, are ball-bearings) is most carefully attended to.

The exterior of the body of the carriage depends of course on the purpose to which it is destined. Messrs. Benz's "Parsifal" car is a type known everywhere, and the "Mercédès" of the "Daimler Motoren-Gesellschaft" is turned out in various forms under the names "Tonneau," "Phaéthon," "Coupé," "Roi des Belges," &c.

In addition to private motor carriages and racing cars, the German motor car industry has developed other types, such as omnibusses, coaches, breaks, travelling and shooting phaetons, motor cabs, military baggage waggons, drays, lorries, business vans, advertising vans, railway vans, parcels delivery vans and others.

Wilhelm Hartmann.

RAILWAYS.

The introduction of railways into Germany was attended with many difficulties, inasmuch as public opinion was opposed to this new means of communication and the authorities adopted a waiting policy. The attitude of the authorities at that time was due to the fact that they considered the recently constructed extensive network of highways and roads, on which large sums of money had been expended, sufficient to meet all the requirements made by traffic for the time being, and that these rendered all new means of communication superfluous. Furthermore Germany was divided into a large number of small states, and the prosperity of the land was so slight, that no productive or enterprising spirit prevailed. After the great importance of railways had been recognized however, and the construction of lines begun, the railway system developed very rapidly, so that at the present time Germany stands at the head of all European countries, as far as the total relative length of lines is concerned.

Companies formed for the construction of railway lines, were subject to the legal regulations of the various Federal States; each railway was consequently worked as an independent enterprise, and this soon led to the necessity of an agreement with neighbouring states in regard to the transit of waggons, uniform style of construction, receipt and delivery of freight, &c. Railway unions between the several connecting lines were consequently formed. The further extension of the network of railways and the increase in traffic finally led to a union of all the lines, carried into effect in 1846 by ten Prussian railway administrations, the new enterprise bearing the title: "Association of German Railway Administrations."

The aim of this Association, which so enormously stimulated the development of German railways, was to promote the interests of railway-companies by conjoint action, and thus to serve individual interests as well as the interests of the general public.

The efforts of the Association were directed towards the establishment of uniform regulations concerning construction and traffic (technical agreement),

the regulation of the reciprocal use of waggons (agreement as to the reciprocal use of waggons within the province of the "Association of German Railway Administrations"), the organization and regulation of passenger and freight traffic, the establishment of railway time tables, uniformity of time, dimensions, weights and coinage, prizes for inventions and improvements pertaining to railway systems, &c. &c.

The Association, however, could exercise very little influence on the tariff. This, and the direct arrangements for conveyance of passengers and freight were regulated by special association tariff unions superintending the traffic in limited districts.

At the end of March, 1896, after fifty year's existence, 74 different railway companies, covering a distance of 80,998·11 kms in length, had joined the "Association of German Railway Administrations." Not only were all German railway companies members of the Association, but also the most important Austrian and Hungarian railways, as well as four in Holland, three in Belgium, one in Luxemburg, one in Roumania, and one in Russian Poland. In addition to the technical and operative regulations of the aforesaid Association, which are based on voluntary agreement, the German railways are directly concerned with the imperial laws, mentioned later on, and such laws as regulate by treaty international traffic with countries not belonging to the "Association of German Railway Administrations." The following may be referred to here: "Technical uniformity in railway systems" and "Regulations for fitting up railway carriages so as to ensure customs being levied in international traffic," accepted as valid by Germany, France, Italy, Austria, Hungary, Holland, Belgium, Roumania, Servia, Greece, Bulgaria, Luxemburg, Denmark, Sweden and Norway. Pertaining to the passage and use of freight waggons, the following treaties may be mentioned, in addition to the "Waggon Agreement" of the Association: "Italian Waggon Regulations;" "Swiss Waggon Union;" "Regulation of the International Union," concerning railway communication with the largest part of the Belgian and French lines, and the "Convention," valid for Alsace-Lorraine and the Eastern Railway of France. The contents of these treaties correspond to a great extent with the "Technical Uniformity" and "Waggon-Agreement" of the Association. Further the results of "Conferences for providing cars" regulate the passenger and freight cars in through trains, and "International Railway timetable Conferences" determine all railway connections. In order to facilitate in exceptional cases the connection of single waggons with express and passenger trains in international traffic, the claims of the several lines have been laid down in the "Lübeck Agreement."

The construction of railway lines in Germany was at first almost entirely in the hands of private capitalists. Later on the several Federal States concerned themselves with railway enterprises, so that in almost all the German states the mixed system of private lines and state lines existed side by side. After the majority of the main lines had been constructed however, and only the construction of less profitable lines was left, private capitalists withdrew. Finally the development of the railway system compelled the transformation

of the mixed system into the state system. Hanover, Würtemberg and Baden were the first countries to adopt the state system, Bavaria and Saxony followed suit in 1869—1876, and Prussia in 1880, after a large part of the railway network had passed into the possession of the state.

The administration of the railways and the supervision of the private lines is left to each Federal State. The Empire, however, has to provide for the enforcement of all regulations contained in the Imperial constitution, as well as all other laws and constitutional regulations pertaining to railways, and furthermore to remedy all existing defects and unfavourable conditions. A special board called the "Imperial Railway Department" has been instituted for this purpose.

In order to attain a homogeneous formation and an uninterrupted system of communication on the German railways, the Federal Council, aided by rules and regulations laid down by the Association of the German Railway Administrations on the basis of the imperial constitution, established in 1892 the following: "Railway Rules" (formerly "Railway Police Regulations"), „Directions for the Construction and Equipment of the principal German Railways," "Railway Rules for Secondary Lines in Germany," (formerly "Railway Rules for German Railways of secondary importance," dated July 1st 1878), and "Rules for signalling."

During the following years these regulations were considerably altered and rendered more complete, and a project to consolidate all regulations into a single "Organisation for the Construction and Operation of Railways," in 1904 is under consideration. According to the above-mentioned regulations, German railways can be divided into main and secondary lines. The latter are distinguished from the main lines in the following points: less speed, a narrower gauge, simpler signalling arrangements, the lines being less carefully guarded and less frequently inspected, fewer brakes in action, a reduced number of enclosures and gatesmen at crossings, as well as greater freedom and increase in the admissible wear and tear of the locomotive and car tires.

Owing to these facilities it was possible to reduce the costs of operation and construction, to extend the railway lines and to connect isolated parts of the country with the main lines. According to "Railway Rules for Secondary Lines in Germany," the secondary railways can employ normal gauge and also gauges of 1 m or 0·75 m. A distinction is made between full and narrow-gauge secondary lines, which are called in several Federal States "local" or "vicinal" railways. These lines employ locomotives as the motor force.

The total length of narrow-gauge secondary lines in March, 1902, amounted to 1,893·25 kms as compared with 1,602·07 kms in 1899. 842·75 kms belonged to the state. 549·22 kms had a gauge of 0·75 m, 218·44 kms one of 0·785 m, 6·61 kms one of 0·9 m and 1,118·87 one of 1·0 m. There were 871 railway stations, i. e., an average of one station for every 2·17 kms. The rolling-stock was constituted as follows: 409 locomotives, 1,114 passenger cars, 185 luggage vans and 8,409 freight and working cars. The loading weight of the freight cars amounted to 5—13 tons, whereas the amount in 1898 was

2—10 tons. Passenger traffic amounted to 192,173,148 kms, freight traffic to 85,185,596 kms. The capital stock was 118,838,707 marks, and the expense for 1 km of railway 67,626 marks. The receipts totalled 10,171,386 marks, expenditure 8,570,092 marks, thus leaving a profit of 1,601,294 marks, or 967 marks per kilometer of track. 4,200 officials and workmen were employed. In transferring freight from one line to another of different gauge, it is unloaded on an inclined plane and a tilting-cart employed, the body of the car being removed with a crane to another frame, or if full-gauge cars, conveyed on narrow-gauge rolling trestles.

The following "Statistics on Railway Traffic in Germany" have been taken from the Imperial Railway Department; they give information concerning the development, importance and commercial condition of the main railways in Germany. The report includes the operations of normal gauge secondary lines during the years 1901—1902.

The first railway—the Ludwig railway—was opened in 1835 between Nurenberg and Fuerth, and was followed in 1837 by the first sections of the Berlin-Dresden line, in 1838 by the Berlin-Potsdam line, and soon afterwards by the first state railway line, that between Brunswick and Wolfenbuettel. The following data show how rapidly German railways developed. The length of the lines (exclusive of small gauge lines) open to traffic in 1836 was 6 kms; 1838: 140 kms; 1840: 549 kms; 1845: 2,304 kms; 1850: 6,044 kms; 1860: 11,660 kms; 1870: 19,694 kms; 1880: 33,835 kms; and in 1898: 47,119·11 kms. The length of the existing railways at the end of March 1902 amounted to 51,092·01 kms. Of this length 46,730·64 kms were state railways (31,197·21 kms main line and 15,533·43 kms secondary lines*) and 4,361·37 kms private railways (1,255·69 kms main line, 3,105·68 kms secondary railways).

Including all tracks let, leased and worked conjointly, the length of lines in use amounted to 51,328·29 kms including 4,343·44 kms of private railways, and was distributed as follows:

	Main lines	Secondary lines	Total
State railways and those under state management	31,366·68*)	15,618·17*)	46,984·85
Private railways under state management	26·61	114·03	140·64
State railways under private management	—	18·43	18·43
Private railways under private management	1,387·03	2,797·34	4,184·37
	32,780·32	18,547·97	51,328·29

*) The length of railways in operation, main and secondary lines has been taken from the statistics published.

32,816·74 kms of private lines had single tracks, 18,103·32 kms double tracks, the rest three and four tracks. 70·50 per cent of this length lay in the straight, and 29·50 per cent in curves.

	Over 100 sq.-metres area	For 10,000 inhabitants
in Alsace-Lorraine	11·48 kms	9·64
„ Prussia	8·80 „	8·86
„ Bavaria	8·90 „	10·85
„ Saxony	16·38 „	5·78
„ Wurtemberg . .	8·61 „	7·70
„ Baden	12·56 „	10·05
„ Hessen	16·03 „	10·90
„ Mecklenburg . .	8·70 „	21·67
Germany 1901 . .	9·44 kms	8·98
„ 1898 . .	8·92 „	8·88

The capital stock invested for full-gauge main and secondary lines was as follows:

For state lines	12,519,775,854 marks,	or 267,957 marks per km
„ private lines . . .	610,754,933 „	„ 140,278 „ „ „
Total amount . .	13,130,530,787 marks,	or 257,035 marks per km

Of this capital about 18·5 per cent was expended in rolling stock.

In addition to bridges, subways, &c., there were 11,570 bridges of 2–10 metres span, and 1,059 bridges with more than 10 metres span of the separate arches. Many of these bridges are of superior construction with spans up to 170 metres. The chief details regarding some of the largest bridges can be obtained from the following table:

Year of opening	Name of bridge	Number of openings	Span metres	Total length metres
1857	First Nogat bridge (the second in 1890) near Marienburg . .	2	103·2	206·4
1857	First Vistula bridge (the second in 1891) near Dirschau	6	121	726
1859	Rhine bridge near Cologne . . .	4	103	412
1862	Rhine bridge near Mayence . .	4	105	420
1879	Rhine bridge near Coblentz . .	2	106	212

Year of opening	Name of bridge	Number of openings	Span metres	Total length metres
1890	Bridge over the Emperor William Canal near Gruenthal	1	165·5	156·5
1893	Fordon bridge near Thorn . . .	13	61·2	1,288·1
		5	98·5	
1894	Bridge over the Emperor William Canal near Levensau	1	163·4	163·4
1897	Wuppertal bridge near Muengsten	1	170	170
1902	Rhine bridge near Worms . . .	2	102·2	321·2
		1	116·8	

There were 557 tunnels, with a length of 197·533 kms; of which 47·383 kms were single track, and 150·150 kms double track.

Broad-footed rails were generally used for the tracks of normal gauge lines; only 136·63 kms (1898: 546·66 kms) having chair rails. The total length of track amounted to 95,705·96 kms (1898: 86,269·5 kms), 69,656·46 kms being "through" track. About 7 per cent of the latter consists of welded iron, or welded iron with steel heads, 67,241·41 kms of the through track rested on single chairs (wooden or iron cross-sleepers and stone cubes). There are on an average 1,240 wooden, 1,263 iron cross-sleepers and 1,663 stone cubes to each kilometer of track. 2,168·46 kms rested on longitudinal sleepers (Hilf system, &c.); 109·96 kms directly on the ballast bed (Hartwig system, &c.). In 1898 these figures were as follows: 62,262·65 kms, 3,019·98 kms and 134·61 kms, bearing evidence in favour of single chairs. The joint of rails is generally effected where single chairs are used by suspended joints.

The weight of the rails of 4,776·32 kms track, amounted to 30 kgs, of 40,419·08 kms track, amounted to 30–35 kgs, of 15,743·72 kms track, amounted to 35–40 kgs, of 5,858·27 kms track, amounted to 40–45 kgs, of 444·02 kms track, amounted to more than 45 kgs.

There were 174,826 switches in use, (reducing the triple and English switches to single switches) 2,083 of which were worked on the track; 778 sliding platforms, 2,121 locomotive turn-tables, 2,150 car turn-tables and 5,380 centesimal scales. 13 works were engaged in soaking and impregnating sleepers. 5,029 fixed and travelling cranes, and 40 shears were employed in hoisting loads. 2,925 water stations with 7,092 water pillars furnished the water required. There were 10,445 stopping places and railway stations. 307 sheds were used for sheltering, cleansing and overhauling cars, and 2119 sheds with 14,750 stands were provided for locomotives. 559 sheds were situated quite close to the water stations.

The signal and communication department employed:

	1901	1898	
Morse apparatuses	25,880	18,217	
Other apparatuses	907	1,586	
Telephones	23,479	13,508	Increase of 74 per cent
Chief mast signals	38,077	29,769	„ „ 28 „ „
Advance signals	15,082	10,870	„ „ 39 „ „
Ringing apparatuses for notifying departure of trains	46,609	45,242	

6,909 wheel keys which prevented by electrical means the highest rate of velocity prescribed being exceeded were employed in controlling 5,548 kms of track where trains had to run cautiously. The proper intervals between trains were secured by means of 3,125 block stations. On lines where many trains run (metropolitan lines, &c.), electric block signals announcing the approach and departure of trains (blocks with four fields) were employed. Furthermore, the signals are frequently connected with rail contacts, closing the track at the rear until a train has passed the signal. Efforts have been made to attain greater security against accidents by increasing the number of distance telephones, thus facilitating the communications between block watchmen and station officials, by employing more advance signals, (in 1898 there was one advance signal to every 2·74 signals, in 1901 one to every 2·52), by guarding trains halting on the open track by means of detonators, and by flag and torch signals. Constant progress in this direction is being made by means of extensive improvements in the mechanical and electrical closing of switches and signals. There were 5,984 signal boxes, mostly towers, for signal, switch and closing apparatuses, affording a clear view of the permanent way.

The cost of maintaining, renewing and supplementing the permanent way, superstructures, telegraph and signal contrivances, buildings, improvements and removal of snow amounted to 235,536,303 marks (1898: 198,302,692 marks) viz. 4,645 marks for every kilometer, 301 marks for 1,000 locomotive kms, and 13 marks for 1,000 car kms.

In March 1902, the rolling stock of the German railways consisted of 19,724 locomotives, 13,827 tenders (in 1899: 12,702), 41 motor cars (in 1899: 26), 39,878 passenger cars (in 1899: 35,062), and 419,990 luggage and freight cars (in 1899: 383,576). The number of locomotives during the past years was as follows: In 1846: 1, 1851: 10, 1860: 180, 1870: 1,414, 1880: 6,253, 1890: 11,304, 1900: 19,069, only 420 of which were built abroad. In 1900, 1,236 locomotives were added to the stock.

The following table gives information concerning the construction of the rolling stock.

Locomotives.

Style of locomotive	Uncoupled axles	2	3	4	5	Total amount
		Coupled axles				
Locomotives with extra tender for passenger and express trains . .	9	5,609	157	—	—	5,775
Locomotives with extra tender for freight trains	—	371	6,827	950	5	8,153
Tank locomotives for passenger train service						
Tank locomotives for freight train service . .	—	2,324	3,361	62	49	5,796
Tank locomotives for shunting						
Total . . .	9	8,304	10,345	1,012	54	19,724

A large number of passenger and freight locomotives are constructed according to the compound system, which is extensively in use at the present time. In order to satisfy the demands for velocity and working capacity, the locomotives have been provided with greater heating surface and constructed heavier, so that at the present time double-coupled passenger and express locomotives, with bogies or adjustable axles, and for certain parts of the lines freight locomotives with five axles are at work. The average weight of the metropolitan locomotives, including tender, amounted to 44·6 tons. 10,568 of the above-mentioned locomotives (in 1899: 8,663) are provided with continuous brakes; 7,233 (in 1899: 5,200) have wheel brakes. 25 of the aforesaid 41 motor waggons are driven by electricity and 16 by steam or combustion motors. The use of cars with combustion motors on secondary lines, is increasing.

During the last few years experiments have been made on the Prussian State Railways with superheated steam, and 70 superheating locomotives were employed for this purpose.

Passenger Cars. 1901.

With entrance at the		Total number of cars	Provided with				Total number of axles	Actual weight to	
front	side		2	3	4	5		1 axle	1 place
			axles					tons	
Actual number									
16,396	25,521	39,917	26,917	10,382	2,609	9	95,470	5·58	0·29
1898									
12,975	22,111	35,086	25,347	8,488	1,247	4	81,170	5·34	0·28

Passenger Cars. 1901.

Brake appliances provided for			Continuous brake appliances provided for	
Passenger cars	axles in general	per cent of axles	Apparatuses	Conduct only
			Number of waggon axles	
Actual number				
33,214	74,453	78	70,114	15,771
1898				
27,640	61,241	75·5	57,009	15,216

The style and equipment of passenger waggons have likewise undergone a remarkable transformation during the last few years. In order to attain very regular, easy motion, the cars were increased in length and provided with double axle bogies. Sleeping-cars have been constructed with triple axle bogies. Numerous trains, especially the so-called through trains (D-trains) are provided with dining compartments for the convenience of travellers; sleeping accomodation has also been enlarged and improved.

The International Sleeping-car Company of Brussels has furthermore introduced so-called "trains de luxe," which enable travellers, in addition to other comforts, to make long journeys without changing, at the highest possible speed: i. e. St. Petersburg-Berlin-Ostende, Paris-Vienna-Budapest-Constantinople, &c. &c. The trains are only composed of first class cars, and an extra charge of 2·3 to 4·5 pf. per kilometer is made for travelling by them.

Passenger trains are lighted with a mixture of oil, gas and acetylene gas. Detailed experiments on a large scale are being made with numerous systems of electricity in lighting single cars and entire trains. The trains are generally heated by steam, sleeping and saloon cars by hot water. On several lines passenger cars are heated with pressed charcoal or by the Swiss hot air system; fourth-class waggons contain stoves.

Luggage and Freight Cars. 1901.

Style of car	Number of cars	Number provided with axles			Number of axles	Actual weight of load on 1 axle	
		2	3	4			
	Actual number					tons	
Luggage cars	9,884	7,614	2,182	88	22,126	4·96	2·42
	(8,664)	(6,919)	(1,658)	(87)	(19,160)	(4·85)	(2·39)
Covered freight cars	122,059	120,886	978	196	245,488	4·03	6·07
	(114,163)	(113,036)	(854)	(273)	(229,726)	(3·86)	(5·75)
Open freight cars. .	288,049	281,114	2,810	4,125	587,174	3·35	6·21
	(260,751)	(254,602)	(2,661)	(3,488)	(531,153)	(3·25)	(6·01)
Total	419,992	409,614	5,970	4,409	854,788	3·59	6·07
Average	(383,578)	(374,557)	(5,173)	(3,848)	(780,039)	(3·47)	(5·84)

Luggage and Freight Cars. 1901.

Style of car	Brake appliances on			Continuous brake appliances on	
	Cars	Axles			
		in general	per cent of axles	Apparatuses	Conduct only
				Number of car axles	
Total	143,154	290,659	34·00	23,835	10,770
Average	(127,327)	(258,046)	(33·08)	(18,681)	(8,741)

The figures in parenthesis refer to 1898. The increased demands on freight cars corresponds to the increase in weight of load. The employment of four-axled luggage cars on express trains increases steadily. The number of postal cars amounted to 2,315 with 6,555 axles (as compared to 2,122 with 5,889 axles in 1898). 876,340,193 passengers were conveyed (1898: 763,048,450); 0·37 per cent in the 1st class (1898: 0·36 per cent), 8·95 per cent in the 2nd class (1898: 9·27 per cent), 55·76 per cent in the 3rd class (1898: 60·41 per cent), 33·25 per cent in the 4th class (1898: 28·37 per cent) and 1·67 per cent military persons; 942,636 tons luggage and 1,714,394 dogs. 20,600,806,229 passenger-kms were run. Each person was conveyed on an average: 23·5 kms.

352,536,405 tons of freight of all kinds were transported (1898: 321,960,842 tons); 35,340,713,249 ton-kms were run. Each ton was transported on an average 100·25 kms. Each freight car axle, in loaded condition, carried on an average 2·77 tons.

The chief articles of transport were: Coal, brick coal and coke; about 92,250,000 tons, Bricks and building materials 22,600,000 tons, Brown Coal 22,229,000 tons, Wood 14,130,000 tons, Earth, clay, &c. 10,528,000 tons, Grain and cereals 9,740,000 tons, Iron ore 9,857,000 tons, Beets 9,038,000 tons, fertilisers, manure 7,196,000 tons.

The amount expended on rolling stock was as follows: Locomotives and tenders 874,943,000 marks, motor cars 1,113,000 marks, passenger cars 412,707,000 marks, freight and luggage cars 1,212,315,000 marks, total amount 2,501,078,000 marks.

The total amount expended for maintaining and renewing the rolling stock was 185,541,049 marks (1898: 161,804,073 marks), or, 4,848 marks for each locomotive, 332 marks for each passenger car axle, and 69 marks for each luggage or freight car axle.

The working capacity of the rolling stock was as follows:

For locomotives, including shunting, service and empty runs, on an average 40,333 locomotive kms, or 26,798 kms with loads; for passenger cars, on an average, per axle, 45,155 car axle km, for luggage cars, on an average, per axle, 49,878 car axle km, for freight cars, on an average, per axle, 15,154 car axle km, all cars together 18,904 car axle km.

471 workshops were engaged in the maintenance of the rolling stock. The total number of persons employed on German railways was 546,210 (1898: 511,013). The managing department occupied 23,612 officials and 2,674 laborers; railway operations and watchmen's services: 34,351 officials, 109,324 laborers; station despatching and conducting services: 128,868 officials, 107,414 laborers; train-despatching and workshop services: 39,624 officials and 100,339 laborers.

In 1901 salaries and wages amounted to 712,024,639 marks. Workmen's pension and relief funds, established by the management, granted 2,792,765 marks for pensions, and 1,318,201 marks for the relief of widows and for educational purposes, 64,413 marks for relief in general and 54,356 marks for burial purposes. At the end of March, 1902, the stock was valued at 110,185,731 marks (1898: 80,754,159 marks).

The annual income from operations on full-gauge lines amounted to 1,972,879,586 marks; expenditure: 1,310,092,757 marks; profit: 662,786,829 marks, or 13,053 marks per kilometre (1898: 15,130 marks) and in proportion to the annual income 33·59 per cent. The capital stock invested bore 5·14 per cent interest (1898: 6·06 per cent, 1900: 5·91 per cent). This shows that the year 1901 was an especially unfavourable one.

In addition to the abovementioned full-gauge railways, the full and narrow-gauge lines not used by the public must also be considered (mining, industrial, agricultural, forest lines). Under this heading all connecting lines with private establishments are placed provided the terminus is not included in the tariff and does not serve for public use. These lines are worked by steam, electric, animal or other power. At the end of March, 1902, the number of full-gauge private lines amounted to 7,235, and of narrow-gauge lines to 480, making a total number of 7,715 (1898: 6,499), of which the industrial lines occupied the first place with 5,595. Of these lines 2,091 were connected with main lines in the open, and 5,624 at railway stations.

Finally those lines must be mentioned which possess a purely local character on account of their inconsiderable traffic. The several Federal States exercise general control over the rights of these lines. In Prussia, a law pertaining to "light railways" and private lines was not passed until July 28th 1892, whereas other states of the German Empire possessed laws in this respect at a much earlier period. In that law, the expression "light railway" was used for the first time. These lines can be regarded as belonging to the third category, if the main lines are designated first class ones, and the secondary lines as second class ones. Compared to the secondary lines the light railways have been granted extra privileges so that they can be adapted to the peculiarities of every kind of ground. According to the above law, under the term "light railways" was understood such lines as conveyed traffic within a certain district or within neighbouring communities, as well as lines not worked by locomotives. Under the term "private lines" the law understands such lines as do not serve for public use, but which are directly connected with main, secondary or light railways, enabling a transfer of material to be made.

The rapid development of small lines in Prussia rendered it necessary to make another division. According to directions issued in August 1898, for carrying the "light railway" law into effect, a division into "metropolitan street railways" and "light railway lines resembling secondary railways" was prescribed. The first class includes metropolitan street railways and such enterprises as resemble street railways in character, construction and management, in spite of their forming a connection between neighbouring localities, their principal aim being the conveyance of passengers. The second class includes those light railways which convey passengers and freight from place to place, and which in extent, plant and management resemble the secondary lines. The "Regulations for Light Railways" were passed almost simultaneously with these directions, and agree in the main with "Principles for the Construction and management of Local Railways," elaborated by the "Association of German Railway Administrations," but are in various points much stricter in character. Light railways as well as private lines may be of full gauge or of gauge measuring 1 m, 0·75 m or 0·6 m.

In Germany full gauge and 1 m gauge are predominant. Gauge measuring 0·6 m is chiefly employed in districts possessing less capital, and for transportable field, forest and mining lines.

Statistics covering light railways throughout the German Empire are not to hand. Only official statistics for Prussia have been compiled, containing also information of those lines holding first charters, as well as statistics of the "Association of German street and Light Railway Administrations." The latter only take into consideration those lines which are in active work; these statistics have however been considerably added to recently, and a combination of both is under consideration.

The following items have been taken from the above mentioned statistics and appeared in the "Journal for Light Railways" published by the Prussian Ministry of Public Works. Street railways and secondary Light Railways are treated separately, according to their condition in March 1902.

Figures referring to the whole of Germany are placed in parenthesis.

Street railways: The number of street railway enterprises was 142 (186), 2,380·7 kms in length (3,006·71 kms at work). One-third were full gauge and two-thirds had 1 m gauge. Other gauges have only rarely been used.

Taking the whole of Germany into account the 1 m gauge has increased to the detriment of the full gauge. The following items are added for information:

a) Passenger traffic in cities	101	lines,	2,040·7	kms	in	length
b) Traffic otherwise than in cities (bathing resorts)	17	„	76·5	„	„	„
c) Trade and industry	20	„	230·8	„	„	„
d) Agricultural purposes	2	„	17·4	„	„	„
e) Trade, industry and agriculture conjointly	2	„	15·3	„	„	„

Rolling stock employed:						
Steam locomotives	on	18	lines,	or	12·7	per cent
Electric motors	„	94	„	„	66·2	„ „
Horses	„	23	„	„	16·2	„ „
Electric motors and horses .	„	3	„	„	2·1	„ „
Cables	„	4	„	„	2·8	„ „

The number of steam locomotives used was 74, passenger cars 10,057, freight cars 882. A steady progress in the employment of power has been noticeable mostly at the expense of horse power. 16,164 officials and 7,379 regular laborers were occupied, of which the Berlin street railways alone employed 5,874 officials or 36·3 per cent, and 1,786 laborers or 24·2 per cent. In Prussia, 799,949,842 persons were conveyed and 726,139 tons of freight transported (in all Germany 1,191,457,092 persons and 971,377 tons of freight). The total number of persons conveyed is equal to 20 times the population of the empire, and in Prussia alone equal to 23 times the population.

Light railways resembling secondary railways: number of lines 213; lenght of lines 6,847·0 kms (5,711 kms). This shows an increase of 9·8 per cent compared with the foregoing year. The gauge on 41·3 per cent of them is 1·435 m; on 24·4 per cent, 1 m; and on 17·4 per cent, 0·75 m. Lines with full gauge are steadily increasing.

The following were in operation: a) for passenger traffic in cities and suburbs 4 lines 55·6 kms, b) for traffic otherwise than in cities (bathing resorts) 5 lines 57·9 kms, c) for trade and industry 64 lines 1,061·1 kms, d) for agriculture 107 lines 4,626·8 kms, e) for trade, industry, and agriculture conjointly 33 lines 1,046·5 kms.

The lines employed for agricultural purposes have increased in one year by 60·7 per cent.

The rolling stock comprised the following: steam locomotives on 196 lines (92 per cent), electricity on 13 lines (6·1 per cent), steam locomotives and electric motors on 3 lines (1·4 per cent), steam locomotives and horses on 1 line (0·5 per cent). There were 725 steam locomotives, 1,689 passenger cars, 10,030 freight cars. 3,483 officials and 3,564 regular workmen were occupied. On these light railways about the same distance in axle kms was run by passenger and freight cars.

In Prussia during the last 10 years the number of street railway lines has almost doubled itself. The length of lines has increased three-fold (172 per cent), whereas the number of secondary light railways has increased from 11 to 213, the length of line from 159·1 kms to 6,847 kms. The total number of light railways in Prussia is 355 lines, the total length of which is 9,227 kms. There are 799 locomotives, 11,755 passenger cars, and 10,912 freight cars in use.

496 concessions for the construction of light railways have been applied for, so that the hopes entertained respecting the "Light Railway" in Prussia show every sign of being fulfilled.

Fritz Herr.

AGRICULTURE.

Climate and quality of soil are the two most important factors which determine the agricultural condition of a country; where these two factors manifest the greatest possible variety, as is the case in Germany, a corresponding variety may be expected in the nature of the agricultural pursuits followed and in the agricultural products found throughout the country.

The German Empire, situated in the colder temperate zone and extending from the high level of the Alps to the low country lying about the North Sea and the Baltic, possesses a climate influenced by the Atlantic Ocean, but at the same time presenting so many various aspects that it not only affects the fertility of the soil in the several districts differently but also necessitates different methods of husbandry and cultivation.

The coldest districts are those in the east of the Baltic, the wooded mountain district of the Hartz, the Swabian and Bavarian Plateaus and the Alpine region which extends throughout Bavaria, Wurtemberg and Hohenzollern. There the spring can scarcely be said to commence before April, while the early coming winter nips all vegetation on field and meadow. Consequently only a short period of growth can be counted upon, during which the hot summer days permit the fruits of the earth to ripen rapidly, while, on the other hand, the long hard winter often endangers the autumn sown corn. In Silesia, on the contrary, which lies in the centre of the Empire, and in Thuringia and Saxony, milder temperature brings the buds out in March, while the Rhine Province, Rheingau and the valley of the Rhine are among the warmest regions. There the vineyards ripen in glorious sunshine.

The rainfall is subject to considerable variation, but is generally sufficient to assure a prosperous growth of vegetation. The rainfall varies in the different districts throughout the year between 400 and 1,720 mms, and between May and September, during which time a constant and regular supply is of such great importance, and after the winter's moisture has been absorbed from the soil, it varies between 248 and 830 mms. Accordingly we find certain districts in which the most delicate plants flourish, whilst in other districts the cultivation of summer crops is endangered owing to want of sufficient moisture. Another peculiar characteristic is that in many extensive districts of Germany

the comparatively heavy rainfall during July and August renders harvesting difficult, which is not the case in many countries. The distribution of atmospheric precipitations over the whole Empire is such that the central and eastern regions are the driest, while the Baltic region is the most favourable for agriculture and the southern mountain district has the greatest atmospheric precipitation.

Besides the varieties of climatic conditions, we find even greater differences in the nature of the soil and in its productivity. In contrast to the great low-level plain of North Germany, which is traversed here and there by low ranges of hills, the low-level plain of the upper Rhine between the Vosges mountains and the Black Forest, and the tertiary valleys between the Danube and the Alps in the south, we also have a multiplicity of mountainous formations of the most varied geological origin. In the plains we have an alternation between the alluvial soils, sometimes found as extensive moorland and sometimes as fruitful marshland and flats, and the dialluvial soils which appear in the form either of erratic loam, clay or sand, in continous surfaces—which whilst resembling each other on the whole, yet show considerable variations—sometimes of fruitful soil, sometimes medium, and sometimes also the most barren, unfruitful soil. The mountainous districts of Germany on the other hand consist for the most part of disintegrated soil which has been deposited upon the original rock. The kinds of soil vary accordingly as the rock from which they are derived was colored sand-stone, shell-lime, marls, silurian, chalk, gneis, micæous schist or argillite. Here and there are also found eruptive formations such as basalt, porphyry, and granite.

Taken as a whole Germany is a land of agricultural contrasts caused by its natural conditions. There are grassy plains and grassy highlands; fruitful, wheat growing valleys and bare sandy plateaus; "golden pasture lands," "fertile plains" and gloomy forests; high and low-lying moorland, and wooded mountains of a hundred different shades.

According to the census taken in 1895, the population of Germany numbered 51,770,284 persons, from among which number the proportion of persons with families and servants engaged in agricultural pursuits (including gardening, stock-breeding, forestry and fishing) was 18,501,307, or 35·7 per cent of the total population. These figures put the agricultural population on about the same level with the industrial population, since the numbers engaged in mining and smelting, in manufactures and the building trade amounted to 20,253,241. The number of persons engaged in trade and commerce and the remaining free occupations is far smaller than those employed in agriculture, for the number of persons earning a livelihood in trade and commerce, with their families and servants, was only 5,966,846, and those following the other free professions and occupations, together with the persons having no stated occupation, numbered only 7,048,890.

The percentage of the agricultural population as compared with the total population varies very considerably in different districts of Germany. In some localities the proportion rises as high as 600 per 1,000 persons, as for in-

stance in the eastern provinces of Prussia; whilst in the centre of the Empire and in the industrial districts to the west it falls in places to 100 and less. Thus whilst the agricultural population preponderates in some parts of the Empire, in other parts we find a mostly industrial population. Taken as a whole, however, agriculture continues to be one of the most important factors in the total industrial life of the population of the German Empire, although the character of the state cannot be regarded as being, on the whole, an agricultural one.

The agricultural population itself is divided into large estate owners, or small farmers and agricultural labourers. An absolutely accurate division into classes cannot, however, be made, since some persons occupy an intermediate position between estate owner and farmer and between farmer and agricultural labourers. The social and economic division of the independent land owners and farmers (i. e. estate owners, tenant farmers, and the large and small peasantry) as distinguished from the agricultural labourers, is represented by the following table, which gives the figures for Germany in 1895.

Holdings, Farms or Estates	Number		Area in hectares	
		per cent		per cent
a) Small holdings, with less than 2 has of land	3,236,367	58·22	2,415,914	5·59
b) Small peasant farms, with 2–5 has of land	1,016,318	18·29	4,142,071	9·57
c) Middle-sized farms, with 5–20 has	998,804	18·00	12,537,660	28·96
d) Large farms, with 20–100 has	281,767	5·07	13,157,201	30·39
e) Farms and estates with, 100 acres of land and over . . .	25,061	0·50	11,031,869	25·49
Total . . .	5,558,317	100	43,284,742	100

This summary shows that agriculture in Germany is principally in the hands of the peasantry. It contradicts an opinion which has been often asserted, that Germany is the historic land of the large estate owner. For although the small holdings of less than 2 has are more numerous than the farms of 2–100 has of land, yet the farms held by the peasantry form 69 per cent of the total area under cultivation, while the large estates only amount to 25·5 per cent, and the small holdings to 5·5 per cent.

In view of the varying conditions of climate and fertility already depicted, and the consequent difference in profitableness of working the various farms and holdings, it is of course natural that the economic importance of the different divisions (according to size) should vary very considerably. The productivity of a middle-sized peasants farm of 20 has in the east may be very different from the productivity of the same sized farm in the most fertile parts of Saxony, Hessen, or Rhineland, and in the same manner a farm of 200 has

in the fertile parts of Germany is far more productive than a farm of the same size in the sandy districts of the North German plain.

Nevertheless in certain parts of Germany farms and holdings of a particular size are the most prevalent. The districts where small peasant farms are mostly found are Baden, Wurtemberg, Hohenzollern, Alsace-Lorraine, Hesse-Nassau and Rhineland. The middle-sized farm of 5–20 has is found most frequently in Hesse-Nassau, Bavaria, the southern portions of Wurtemberg and in the smaller states of central Germany. The larger farms are found in Brandenburg, East Prussia, West Prussia, Schleswig-Holstein, Hanover, Saxony, Westphalia, Oldenburg, Saxe-Altenburg, and Lippe. Parts of Bavaria too belong to the districts where larger peasant farms and estates are found, as also the eastern provinces of Prussia and both the Mecklenburgs. Although this district must actually be characterised as that of the great farms and estates, the fact must not be overlooked that even here peasant farms occupy 15–25 per cent of the area under cultivation, so that the statement is confirmed that agriculture in Germany is, as a whole, principally carried on by the peasantry.

Besides the independent farmers who cultivate their own land, there is another class of farmer represented in Germany, though not in very great numbers,—the tenant-farmer. It is principally the property of the Crown that is let out to tenant-farmers, who, in consequence of the strict requirements made by the Crown as commissioners to their capabilities as farmers and the working capital at their disposal, have done much in the way of laying out model farms, and have been very successful in influencing wide circles by their example. The landed property owned by the Crown comprises for the most part large estates, but even where the land is divided up into small holdings the tenant system plays a very important part. It is seldomest found among the peasantry, but then generally takes the form of some additional acres which the farmer wishes to add to his own land for cultivation.

The third class of the population engaged in agriculture is that of the agricultural labourers. This class too assumes a different social and economic position in different parts of Germany. Three large groups can be distinguished according to the localities in which they are situated.

The first group is found in Westphalia from the Dutch frontier to the Weser. This is the home of the hired labourer who rents a small holding from the farmer, for whom in turn he must do a certain number of days' work in return for a small wage. The proprietor, on his part, provides the necessary horses or oxen for working the labourers' holding. During the winter months, when the labourer has little work to do in the fields, he finds some industry with which he can employ himself at home and add to his earnings. The most advantageous feature of this condition of affairs is that there exists practically no social difference whatever between labourer and proprietor.

It is between the Elbe and Weser in Mid-Germany, and in the districts of South Germany that we find the home of the free labourer. Here there

are single estates lying between distant villages. The villagers themselves, the owners of small holdings, the cottars, the tenant farmers and peasants who one and all form part of the community, are in this case the persons who supply the necessary hands to work the estate. Here, however, it is not the work upon the land but the actual possession thereof which forms the basis of these persons' existence. As regards their social position they are just as firmly established in their home as the labourers in Westphalia. But the labour which they are able to contribute to the estate owners in districts where agricultural pursuits are much followed is no longer sufficient, and here too we find that the itinerant labourer has made his way just as in many places east of the Elbe.

Finally in the eastern provinces we have either to deal with districts where the frequency of the villages makes the population dense and consequently offers the necessary supply of labour (in some instances more than is required), or else we find districts of large properties or manors, as in Mecklenburg, and Uckermark, Pomerania, West Prussia, Posen and East Prussia. Here the prevailing system for the labouring classes is a sort of bondage. The land owner makes sure of having the necessary labour for a given period of time by means of a contract which covers not only one man but his whole family. The family is established in the cottages which stand upon the estate, and must work for the owner of the estate. The work is paid partly by time and partly by piece. In addition to this the labourer receives ploughland and pasturage from the estate to enable him to support himself and feed his cattle. He has no land of his own. Being entirely dependent on his employer his position is not one to command great respect in the community, and he has consequently not many ties to bind him to his home. He becomes unsettled and moves from place to place,—often into the towns, which offer the attractions of higher wages and more amusement. This has given rise to rural depopulation in the east, which finds but a weak compensation in the immigration of itinerant Poles and Russians. And this practice of moving about is perpetually on the increase, so that now a movement en masse from east to west takes place every spring, while in the autumn the people flock back again.

The efforts which are being made to improve the conditions of agricultural labour in the eastern districts are accordingly directed to retaining labourers in the country by securing small plot holdings for them and giving them small establishments. Attempts are being made as well as by the State to cope with the scarcity of labour in this manner by private societies and land owners.

Great as are the differences in climate and productivity of the soil in the several regions of the German Empire, we find just as great a variety existing in the nature of the several agricultural occupations; districts where the farmer is chiefly occupied with the raising of cereals—in some cases even to such an extent that it is carried on entirely without stock—are varied by others whose rich meadows and pasture lands naturally favour stock breeding.

But in many places we find both equally represented. This may be owing to the fact that advantages for both are offered by the natural conditions, and that the land is equally divided between ploughland and meadow; or it may be due to a better soil and damp climate which make the land more suitable for the cultivation of fodder, or that the establishment of distilleries and the cultivation of sugar beets and sugar-making provides rich food-stuffs for stock.

The proportion which the above named branches of industry bear to each other in Germany at the present day is as follows: ploughland and market-garden, exclusive of such used for the cultivation of fodder, pasturage, sugar beets and potatoes, covers an area of 18,846,800 has, or 53·8 per cent of the whole area under cultivation. Meadow land in Germany covers 5,956,200 has or 17 per cent, rich pasturage 795,100 has or 2·3 per cent, poorer pasturage (Hutungen) 1,911,600 has, or 5·4 per cent, vineyards 135,200 has, or 0·4 per cent, fodder crops 2,656,700 has, or 7·6 per cent, cultivated pasture 1,051,100 has, or 3 per cent, sugar beets 460,900 has or 1·3 per cent, and potatoes 3,241,800 has or 9·2 per cent.

The establishment of the above mentioned technical by-industries has had a great deal of influence upon the nature of the separate agricultural pursuits. Where sugar-making is carried on, the whole industry of the neighbourhood is engaged in the cultivation of sugar beets. Where sugar beets are grown, we find that a deep turning of the soil has been introduced, that it is carefully worked with ridge drills and hoeing machines, and that artificial manures are much more freely used. The breeding of draft and other cattle, too, is influenced to some extent by the growing of sugar beets. The more thorough working of the ground requires heavier draft horses or oxen, and at the same time, in consequence of the abundance of richer food, more attention is given to dairy farming and stock fattening. Distilling and the manufacture of starch, which depends upon the cultivation of potatoes, have an effect upon agricultural pursuits similar to that of the sugar industry: in the latter case the produce necessitates hoeing and a very thorough working of the ground. The distilling industry certainly tends principally to retard the cultivation of valuable food-stuffs in farming, but the commercial value won by introducing these by-industries is of very considerable importance, since the annual value of the sugar produced amounts to 351 million marks, of spirits to 197 million marks, and of starch to 72 million marks.

Owing to the difference in climate and productivity of the soil we do not find large districts in Germany where one or the other system of farming is carried on exclusively. There are however small localities where the conditions are sufficiently constant to cause some particular branch of farming to be the prevailing one. The provinces of Erfurt, and Cologne, for example, and the principality of Schwarzburg-Sondershausen may be pointed out as districts in which husbandry pure and simple predominates, while on the contrary the marsh districts in the province of Schleswig, parts of the province of Stade, the Duchy of Oldenburg, and, in Southern Germany, Bavaria and the province

of Freiburg are particularly favourable to stock-grazing on account of their extensive meadows and pasture lands. For districts where fodder and food-stuffs are the chief agricultural products, the province Rhenish Hesse and the district of Chemnitz may be cited, the Duchy of Brunswick and the province of Merseburg for the cultivation of sugar beets and for potato growing, and for distilling purposes among other places the government circuit of Frankfort-on-the-Oder.

The form of husbandry most generally practised in Germany at the present day is that of the simple or modified rotation of crops, but where particularly favourable conditions of soil exist, we find a free method of cultivation without a regular rotation. In both systems a similar aim is followed, to obtain the greatest possible quantity of raw products by using and maintaining the natural qualities of the soil appropriately by means of increased tillage by machinery or hand, and by expending considerable sums upon manuring the fields.

Stock-breeding in Germany is in reality dependent upon the smaller farms, these being engaged in every branch of stock-breeding. There are at the same time remarkable differences in the groups of farms (grouped according to size) as far as advantageous stock-breeding is concerned. Horse-breeding for example grows relatively with the size of the farm, for it is found principally among the larger of these farms. Sheep are mostly bred on large estates, whilst on the other hand small farms in Germany breed more swine and horned cattle than large estates, though naturally the latter take a considerable part in breeding. Finally comes goat breeding, which is only of general importance for quite small farms.

The actual centers of cattle-breeding are the pasture and moor-land farms. The former are most frequently found in the marsh-lands of the Baltic region, in the valleys of the larger rivers, and in the mountain districts of Germany. The moor-land farms are principally situated in the districts of North Germany which are favoured by sea coast climate. In both kinds of farms fat stock-raising and dairy-farming are carried on; their principal occupation, however, is the rearing of stock. Those farms where the fodder required for the stock is obtained from tilled land, or where the existence of technical by-industries causes a particularly valuable supply of food-stuff, are not so well adapted for stock-rearing as for stock-fattening and dairy-farming, which consequently form the chief occupation.

The agricultural industry of Germany has from time immemorial been based upon husbandry, and the latter therefore plays the most important part at the present day in the agricultural activity of the nation. In spite of this, however, Germany does not provide sufficient corn for her own population, but considerable quantities of wheat, rye, barley and oats are imported annually from abroad. The effect of this inrush of foreign grown grain upon German agriculture has been to considerably reduce the price of corn in Germany during the past half century. In order, therefore, to gain any profit at all in spite of the low prices, the endeavour is becoming more

and more evident in Germany to obtain a greater raw production per hectare, even at an increased expense of labour and capital; the production must be sufficiently large to ensure a profit in spite of the great expenditure of work and capital.

The increase in raw productions has been largely due to the discoveries in natural science of such well-known men as Thaer, Liebig, Hellriegel, Schulz-Lupitz, Rimpau-Cunrau and Rimpau-Schlanstedt. The natural sciences have also been assisted by the advances made in technology and engineering. Drainage has been applied to the general advantage of the German farmer, and agricultural implements by which deep tilling and careful working of the soil can be effected, have taken the place of the light implements of former days.

The area under cultivation in Germany for husbandry and market-gardening amounts in all to 26 million hectares or 48·6 per cent of the total area of land devoted to agriculture and forestry. This area is divided according to the crops grown upon it as follows: legumens 16,050,990 has, or 61·1 per cent of the total area; hoed crops and vegetables 4,593,220 has, or 17·5 per cent; produce grown for purposes of trade 187,910 has, or 0·7 per cent; fodder 2,656,660 has, or 10·1 per cent; pasturage and fallow land 2,285,740 has, or 8·7 per cent; house and fruit gardens 482,790 has, or 1·9 per cent.

The greater part of the grain crops i. e., 14 million hectares, or 88·7 per cent of the total harvest area, is made up of wheat, rye, barley, and oats. But the cultivation of these several kinds of grain is very differently proportioned; for rye alone takes up 6 million acres or 38 per cent of the grain growing area, oats 4 million hectares or 26 per cent, wheat 2 million hectares or approximately 13 per cent, and barley 1·7 million hectares or 11 per cent.

Rye is grown principally in the southern part of the low-lying plain of North Germany, a region beginning at the lower Ems, extending through the province of Hanover up to the province of Brandenburg where the Havel and Elbe flow together, and from thence as far as Lusatia and the parts of the province of Posen which lie between the Warthe and Netze. In the northern portion of this plain the cultivation of rye is rather less extensive; in place of it oats are far more generally grown in the northern districts of Hanover and Oldenburg, in Schleswig-Holstein, in Mecklenburg, Pomerania, and East and West Prussia. In the rye districts proper, oats are of rather less importance.

Wheat and barley, which are more difficult to grow and require more attention, are of but small importance in the above mentioned district, a few favoured spots excepted where the soil is particulary suited for these sorts of grain. Such exceptions are the Vistula valley, the Oderbruch, and certain districts of the Uckermark extending as far as Mecklenburg.

In central Germany we find no large districts with such distinctly marked contrasts as those in North Germany just referred to. The preference in the different districts for one or another kind of grain varies according to the climate and the quality of the soil. In the sugar-beet district, however, and in the meadow and pasture-land district as well as in the southern portion of the province of Saxony, wheat and barley are slightly in excess, whilst

in the higher lying districts, such as the Hartz and Weser highlands, oats and rye are more common.

In South Germany on the other hand, in Wurtemberg, to the West of Bavaria, rye is little cultivated, while to the east of Bavaria it is more general again. In place of rye we find in the first named districts that special preference is shown to spelt, barley and oats. Certain parts of Alsace-Lorraine again are eminently wheat-growing districts, and the Grand Duchy of Hesse is noted particularly for barley. In certain districts of the Rhine valley, however, rye is grown to a greater extent than in the neighbouring regions.

Such is the varied distribution of these four principal kinds of grain in Germany, according as the climate and soil favours specially the one or the other. But it is not alone the relative area under cultivation which determines the importance of any particular grain in a country's husbandry, but the amounts obtainable from the different areas under cultivation.

It is difficult to imagine greater differences in this respect than those found throughout Germany. The lucrativeness of growing oats, for instance, depends very considerably upon whether the particular districts planted are situated in the really barren highlands of Germany or in the fruitful plains and valleys. In the same way the advisability of sowing rye depends on whether it is to grow on the barren hill districts of the North German plain, in the sandy tracts of the Mark, or in the highly cultivated and fertile districts of the Magdeburg lowlands.

Throughout the Empire the average annual harvests per hectare during the last four years have been as follows: wheat 18·50, rye 14·60, spring-barley 18·25, oats 17·10 d.z.*)

The smallest harvests gathered were:—wheat 14·2 d.z., in Wurtemberg, rye 11·5 d.z., in West Prussia, spring-barley 14·3 d.z., in Westphalia, and oats 13·4 d.z., in Hohenzollern. The heaviest harvests noted were:—wheat 25·8 d.z., in Anhalt and Schleswig-Holstein; rye 21·2 d.z., in Schaumburg-Lippe; barley 24·2 d.z., in Anhalt, and oats 23 d.z. in Brunswick.

The total average harvests for the last four years amounts to 3,521,965 tons of wheat, 8,720,840 tons of rye, 3,101,847 tons of summer barley and 7,098,080 tons of oats.

Amongst other cereals, legumens are still more extensively cultivated, and occupy roughly 1 1/2 million hectares, or 11 per cent of the area devoted to the growing of grain. These take an important position in the rotation of crops owing to their property of enriching the soil by being collectors of nitrogen. They are grown sometimes by themselves, or occasionally mixed with other cereals. They are sometimes grown for obtaining seed or green fodder, sometimes for ploughing into the ground as manure. This latter is done principally with lupines.

Amongst the group of hoed crops and vegetables which occupies 4·6 million hectares or 17·5 per cent, the lead is taken by potatoes with 3·2 million hectares. Then come beets for fodder with roughly 500,000 has and sugar

*) 1 Doppelzentner (d.z.) is about 2 cwt.

beets with 476,000 has, 15,700 has of this area being employed for seeding. A further area of about 300,000 has is devoted to various kinds of turnips and beets for fodder purposes, tops and wild cabbage. We also find here and there in Germany cultivated fields of vegetables, such as cucumbers, onions, asparagus, horse-radish and various sorts of cabbage.

Amongst crops grown for trade purposes we find the cultivation of rape seed and colza, hops, tobacco and chicory. This branch of crop cultivation is not very extensive and is only of local importance.

Finally fodder-growing such as the clovers, grasses—sometimes mixed with clover—lucerne and serradella, occupies 2·6 million hectares or 10 per cent of the arable land. Besides this there are about a million hectares of pasturage devoted to the growing of fodder for cattle.

The development of German stock-breeding has followed the course which appeared likely to produce the greatest possible amount of profit. Just as during the last ten years Germany has been becoming less and less a purely agricultural country and has gained more and more in industrial importance, this course of development has been taken into account by the agricultural population engaged in the breeding of stock. The idea was formerly cherished that stock-breeding was a necessary evil indispensable for obtaining the manure required for husbandry, and the profit which the farmer made from the sale of cattle and animal products was of but secondary importance. To-day other views prevail. For while the prices obtained for the products of the earth have been constantly decreasing, the prices given for all animal products, with the exception of wool, have remained firm. This is owing to the greater demand for food by the constantly increasing well-to-do industrial classes, and to the difficulty of transporting such products in Germany. And if a reason for the increase of attention now paid to stock-breeding is to be found in the above mentioned decrease in prices, another good reason exists in the technical progress which has been made in the study of cattle rearing and feeding which has led to the possibility of raising the value of an estate by stock-breeding, thus rendering the employment more general and popular.

Under these conditions stock-breeding in Germany has developed to a great extent, as can be gathered from the following statistics. At the present time there are in Germany: 4,195,361 horses, valued at 2,352,063,600 marks; 18,939,692 horned cattle, valued at 4,182,248,200 marks; 9,692,501 sheep, valued at 194,812,200 marks; 16,807,014 pigs, valued at 913,712,800 marks and 3,266,997 goats, valued at 54,565,000 marks.

Horse-breeding has been developed in Germany in two directions. The breeding of blood-horses for saddle and carriage has occupied a place of importance now for many years. The principal center of this branch of horse-breeding is in the North German plain. The Kingdom of Bavaria, however, also breeds principally blood-horses, though of heavier type than the North German breeds. Besides these districts, we also find the blood-breeds in parts of Baden, the Grand Duchy of Hesse and the Province Hesse-Nassau. In North

Germany, the Trakehnen breed in East Prussia, and the Celle provincial stud in Hanover especially deserve to be mentioned. More recent breeds are those of Oldenburg, Schleswig-Holstein and East Frisia. The breeding of shire-horses, and heavy draught horses, is of considerably more recent origin in Germany. It is carried on principally in the Rhine Province, in Westphalia, Thuringen, the Province of Saxony, the Kingdom of Saxony, the Grand Duchy of Hesse, in Wurtemberg and Alsace-Lorraine. The sires and dams kept here belong to the Rhenish Belgian breed, the Clydesdales, Shires and Percherons.

The breeding of horned cattle is the most important of all breeding occupations as far as the number and value of the beasts is concerned. The breed itself has also considerably improved in consequence of the rise in the demand.

In parts of the North German plain, where at one time one used to see herds of cattle with black and brown, red and gray beasts mixed all together, we find to-day uniform lowland breeds. These are either breed for milking purposes, such as the Angler, North Schleswig, red East Frisian, colored Westphalian and Oldenburg highland breeds, or they may be breeds noted both for being good milkers and for fattening well, such as the colored East Frisian, the Breitenburg and black and red lowland breeds of East and West Prussia, of the Warthe and Netzebruch districts, of the Altmark, Posen, Lüneburg and of the lower Rhine valley; or, again, they may be breeds whose good fattening is of more importance than their being good milkers, as, for instance the Weser valley breed and the reddish Holstein moorland breed. About 55 per cent of all the horned cattle in Germany are comprised under these breeds, the other 45 per cent being made up by the Hohen breed, which is found in Middle and South Germany. The most important branch of the Hohen cattle is the large spotted Simmentaler breed, which is noted for its famous fattening qualities; it produces good draft-oxen at the same time, whilst its milking properties are of secondary importance. This breed alone makes up 36·4 per cent of the Hohen cattle. A good milking breed amongst these latter is found in the grayish-brown highland cattle and those of the Vosges mountain districts. Besides these the provincial cattle of upper and lower Bavaria, the Franken, the Pinzgauer and the Glan-Donnersberg cattle are typical representatives of the Hohen breed in South Germany, whilst the breeds of the Vosges mountains, Siegerland, Westerwald, Wittgenstein and the Hartz, are found in the highlands of middle Germany, though they have only quite a local importance as compared with the first named breeds.

Sheep-farming is the only branch of stock-breeding which has fallen off in Germany during the last ten years, and this in spite of the fact that it was once most flourishing in this country, and very profitable. Its decline was due to the competition of wool from foreign lands beyond the seas, for the flooding of the European markets with colonial wool reduced the price in Germany to such an extent that sheep-farming was no longer profitable. Moreover the intense activity of farming at the present day helped to spoil the industry. The falling off has not only been in numbers but also in breed.

At one time the production of fine and extra fine wools was widely spread, but at the present day more attention is paid to fattening, through which of course the fineness of the wool has had to suffer. The production of good worsted wools, however, has not suffered to the same extent. An important part too is played by the sheep found in central and southern Germany, whilst the better class sheep-farming, both for fat stock and for wool, belongs principally to the east. A peculiarly typical form of sheep-breeding is furnished by the wandering herds of Wurtemberg.

In the breeding of pigs we find a greater increase than in all other branches of stock-breeding. Not only has it doubled during the last ten years both in value and in numbers, but the growth in both respects has been more rapid than that of the population. Pig-breeding is directly connected with cattle--breeding, as it utilizes waste dairy material, and consequently prospers in proportion.

In addition to this it is the cheap kind of pork that is demanded by the great mass of the population, and owing to the great rapidity with which pigs breed, pig farmers are easily able to meet all demands. Besides the increase in numbers the great advance in pig-breeding has been accompanied by an improvement in breed owing to the importation of early bearing English sows, particularly the large white Yorkshire sow. The black Berkshire pig has played a less important part in German breeding. But the efforts of pig-breeders are directed not so much towards spreading a pure English breed of pigs throughout Germany as towards procuring with the help of the English breeds an improved German breed of pigs, which is likely to prove especially useful under the conditions which exist in Germany.

Finally goat-breeding has also experienced an increase as well as an improvement, partly under the influence of the breed introduced from Switzerland, and partly in consequence of an improvement in the national breeds.

The development of farming during the 19th century shows signs of an unusual perfecting of technology in every direction. The increase in the population rendered a very considerable increase in the production of food-stuffs necessary if Germany was not to become too dependent upon foreign imports. At the same time, however, the prices to be obtained for agriculture products were going steadily down, so that it was only possible to increase the production provided that it grew more rapidly than the increased amount of capital and labour spent upon it. This, however, could only be effected by perfecting the technology of agriculture. Consequently, we find a more thorough and careful tilling and working of the ground, a proper amount of manuring combined with a suitable rotation of crops, a proportionate breeding of cattle and rational feeding of useful stock accompanied by a greater extension of technical by-industries practised to-day than was formerly the case. These are the factors which have led to an improvement in agricultural production.

Although the results which natural science has attained in the course of the 19th century have laid the foundations of this progress, it has been

first and foremost the public measures and the associated enterprises that were undertaken at the same time which have been responsible for these scientific discoveries being put into actual practice and turned to account.

A hundred years ago the agriculture of Germany was subject to such restrictions that progress was scarcely possible. It was only the legislation of the first half of the 19th century, which by doing away with peasant service and dues, the pasture rights upon other persons' land, the confusion of plot holdings and the system of compulsory meadows, opened the way to improvements in farming and husbandry. It was not until the free peasant could employ his whole time in farming his own ground by aid of the knowledge obtained from external sources that he was able to carry on his work practically.

But provisions have been made by the establishment founded by the state for agricultural instruction to assist the farmer in obtaining the knowledge necessary for practical farming. In this connection we may mention the founding of agricultural faculties at universities and agricultural colleges, of schools of husbandry and winter schools, the engaging of itinerant lecturers on agriculture and special branches connected with it, such as dairy instructors, stock-breeding and fruit-growing instructors, itinerant teachers from associations, and, finally, the establishment of experimental farms.

The perfecting of technology in agriculture would not however have been possible under present financial conditions if the agricultural credit-advancing system had not proportionately increased.

Splendid results have been attained by the provincial banks and the loan establishments connected with them, as well as by those banks, provincial credit banks and credit banks and credit-advancing institutions established by the state, by provinces or by united communities.

Last but not least, the agricultural societies and associations have exerted their influence to assist the advancement in technology. The farmer's home and sphere of work is naturally the open country, and he is consequently from the very beginning separated to a certain extent from the centres of social life and from his companions in the same profession. But when the farmer came to recognize the fact that he must remain in touch with the centre of all scientific and economic life in order to have a share in the progress made, he found that farmers' societies or associations were the means by which to attain his object, and consequently we find throughout Germany a great number of local societies, branch societies, circuit and district societies which form the basis of the farmers' associations. These are connected one with another by central societies, chief and provincial societies in the separate provinces and small states. These central societies in most parts of the German Empire are now being replaced by legally incorporated Chambers of Agriculture, find in their turn a common union in the general representative bodies of the individual states, viz., in Prussia the College of National Economics, in Bavaria the Board of Agriculture, in Saxony the National Board of Husbandry, in Wurtemberg the Central Office of Agriculture, and finally the German Board of Agriculture for the whole Empire.

If these bodies are rather of an official character, there are also large associations which are entirely of a private nature, such as the Farmers' Union, whose aims are principally of a political nature, and, for special branch interests, the associations of distillers and sugar beet growers, the society of German hop growers and many others. The most important association of this kind, and the one which has made it its object to further the technology of agriculture in every branch, is the German Agricultural Association founded in 1884 on the lines of the Royal Agricultural Society of England. Its founder was the well known engineer Max von Eyth, and it numbers at present 14,000 members from all parts of Germany. It is strongly supported financially both by the voluntary subscriptions of the members and by the surplus profits from its own undertakings. Its aim is to further the technology of agriculture by means of annual Agricultural Exhibitions held in different places, which have won the recognition due to them at home and abroad, and by means of meetings held thrice annually at which the public is informed of the work that is being done for the improvement of husbandry, the theory of manuring, seed-culture, stock-breeding, cattle-feeding, agricultural machinery, fruit and vine-growing, building and architecture, the theory of farming and of the cultivation of the soil.

Side by side with the Agricultural Societies we find the Farmers' Co-operative Associations. In the middle of last century Schulze-Delitzsch and Raiffeisen started the movements which have spread so widely and generally throughout the whole of Germany, particularly during the last ten years. The most important factors are the savings and loan banks. Besides these we have the Central Credit Association and Central Association Fund. The associations of agriculturists transact the sale of requisites such as strengthening fodder, artificial manures, cabbages, machinery, &c. The farmers' Supply and Demand Associations attend to the disposal of and the demand for agricultural products. The most important are the Milk Associations, which have of late been assisted in many of the larger towns by associated societies founded by the dairy-farmers for the sale of milk, &c. Besides these there are a large number of associations which attend to the disposal and sale of fruit and vegetables of every kind. During recent years Silo Associations for the sale of grain have sprung into existence, as well as associations for the sale of spirits; this latter includes by far the larger proportion of potato-spirit producers. Besides smaller associations for the sale of stock we also find slaughter-house associations, which are, however, only of local importance. There is in addition the Central Cattle Association, the object of which is to regulate and organise the cattle trade of Germany.

Dr. W. Schultze.

ARTICLES OF FOOD.

The last few decades have wrought great changes in the domain which concerns itself with the food of nations, and especially in that of the German people. The preparation of raw materials and of wholly or partly manufactured articles, which was formerly carried on in single families or by small tradesmen, has been gradually absorbed by large manufactories or wholesale industries, a movement which displays a marked feature of the new conditions, in tending to establish new standards for food stuffs.

In consequence of the extended means of communication, many German territories which had hitherto been shut off from traffic, have been brought into touch with the markets of the world, and channels have been opened for the increase of their manufactures and consumption.

To this may be added the increasing demands for victualling the army and navy, as well as traffic with the colonies and distant lands. The extent and universally recognised prominence of the great German shipping companies have also had a twofold effect in stirring the home industries into activity, for not only have they brought suitable raw materials to Germany's doors, but the requirements of foreign countries with regard to taste, packing and external finish have been made distinctly evident.

Social legislation has raised the general conditions of life among the German people, and thus among the broad masses of the population the desire to make use of formerly quite unknown articles of food and luxury has asserted itself, or to provide substitutes where means have not sufficed to procure these.

Pettenkofer, Voit, Rubner and other German scientists have tried by comprehensive studies to solve the problems of dietetics and metabolism, and their discoveries have opened new outlets for German industry. Men like Liebig, Koch, Soxhlet, Aubry, Vogel, Delbrück, Wortmann and their co-workers have not only created new principles, new methods and new preparations, but have also relegated antiquated views to the back-ground, replacing them by new ones. Seel, von Buchka, König, Hilger, Fresenius, Forster, Kayser and others have improved the methods of research, organised the supervision of markets, moderated extravagance betimes and shown industry the way which it must earnestly strive to follow in order to advance with success.

And thus from natural necessity a mighty impulse has been directly given to the German provision industry by the consolidation of technical methods and contrivances for making manufactured articles tasteful, and by the reformation of the process of manufacture itself in accordance with the principles of hygiene.

Germany is partly indebted for this progress to the many societies in manufacturing circles, such as the "German Agricultural Society," the "Association of German Vintners," the "Association of German Brewers," the "Association of German Butchers," the "Association of German Chocolate Manufacturers," the "Association of German Pastrycooks," the "Union of German Provision Merchants and Dealers," &c. It has been recognised that a mixture of the mostly unsurpassed native raw products with foreign wares is in many cases advisable in order to produce a savoury and nourishing article. Various ways have been tried to improve the quality of the latter; one has been to deprive the materials of some of their less valuable ingredients by refining; another has been to add well known substances containing a high proportion of fat or nitrogen to the aforesaid materials in accordance with the rules of rational dietetics, and a third, to produce delicious and entirely new foods.

Particular attention has been paid to the nourishment of children, the sick and convalescents, not only by the perfecting of contrivances for sterilizing and pasteurizing, as also by the process invented for rendering milk free from germs by filtration, but also in adding quite new dietetic preparations to the old infants', babies', and starch foods. The scientific investigation and rational methods of producing these is a specially German feature, and this branch of German industry has attained a particularly high stage of development. Among others Tropon, Somatose, Sanatogen, Nutrose, Plasmon, Eukasin, Roborat, and preparations of gluten are great articles of commerce to-day. They are mostly produced from animal or vegetable albumen, and many millions of capital are invested in their manufacture. These preparations contain albumen in sometimes an already partially digested state, sometimes in an easily soluble combination, or already mixed with other substances, so that doctors not only have a large number of such preparations at their disposal, but numerous ways are opened up by which the social economist and friend of the people can improve the food of the masses.

These dietetic preparations are taken either by themselves, mixed with cooked foods, or sold to the public in a special form, for instance as baker's wares, &c.

Methods of practical bacteriology and of zymology are extensively applied in the production of articles of food, for instance in the prevention of errors in dairies in making butter and cheese, and in the production of such fermented liquors as beer, wine and brandy. New and prominently technical methods of fermentation have thus been brought into use. Liquors containing little or no alcohol, particularly fruit wines, have increasingly come into vogue to aid the battle against alcohol.

New legislative regulations have been issued regarding means of preservation, chiefly of meat, so that particular efforts have been directed to the preparation of goods that keep well. It may be mentioned here as a triumph of German industry, that a large quantity of preserved provisions left over from the German South Pole Expedition were found on its return to be absolutely well preserved both as regards quality and taste.

Besides these efforts for the improvement of articles of food, the endeavours for cheapening the same are noteworthy. This has been achieved by using the best machinery, and also by utilising the by-products as raw material for other purposes. In regard to the low rate of mortality prevailing now in the German Empire according to the latest statistics (15 per thousand in January 1904), it may well be asserted that the German provision industry has contributed in no inconsiderable degree to this gratifying result.

The most important auxiliaries in the German provision industry are order and cleanliness and due regard to all the demands of hygiene. This is not only assured by close competition among the manufacturers, but also by German social legislation, as well as by the supervision of the works by state-appointed trade inspectors and commissioners of trading associations.

Numerous factories have, however, their own laboratories, chemists and hygienists, or their management is under the technical and scientific control of some experienced public chemist. In many branches of industry manufacturers have formed associations for the purpose of producing standards for genuine and reasonably priced articles of commerce, and of preventing adulterations. This assures the goods put on the market being thoroughly genuine, which aim is also materially assisted by a commercially organised control by the official authorities, state laboratories and public independent sworn trade chemists. Trade associations, commercial and scientific publications and regularly recurring meetings for the discussion of current questions, keep manufacturers in active communication with one another.

The Imperial Board of Health takes a warm interest in this work, and is prominently active in securing uniformity in criticism and methods of testing goods. At the Universal Exposition at Paris in 1900, the German victualling industry was represented by an admirable collection. Of the 124 exhibitors, 4 did not compete; the remainder carried off 7 Grands Prix, 33 gold, 62 silver, 18 bronze medals and 5 honorable mentions, making a total

of 125 awards. Since then the German nation has had to pass through a short but severe commercial crisis. The greatest attention must be paid during such periods to improving the methods of manufacture in order to keep pace with foreign competition; in this way the German provision industry has made advances, and stands to-day like a sturdy tree fraught with sprouting buds in the centre of the economical development of the German people.

The German provision industry studies the wishes of its customers with regard to packing as far as possible. Stimulated by former success and animated by an earnest desire to improve still further, it has taken absolute purity, perfect cleanliness in working, and attention to all the requirements of hygiene and dietetics as guiding principles, and by these means may be confident of maintaining an honorable position in friendly competition with other nations in the markets of the world.

H. Becker.

WINE CULTURE, THE WINE TRADE, AND THE MANUFACTURE OF SPARKLING WINES.

Wine culture in the German Empire is of very great politic-economical importance in spite of the fact that only one 450th of the total area of the country is used for this purpose, and the further circumstance that it lies very near the northern limit of the growth of the vine. This is best seen by making a comparison with other wine-producing countries. Although from the point of area devoted to wine-growing Germany ranks no higher than tenth in the list, the money value of its output brings it nevertheless to the fourth place on account of the remarkably excellent quality of the wines from certain parts of the country in good years. The following table shows this very clearly.

	Area in hectares devoted to wine-growing	Yearly average yield in hectoliters Millions	Value in marks Millions
Italy	3,430,000	30·7	614·0
France	1,761,000	30·5	490·0
Spain	1,605,000	29·0	493·0
Hungary	365,000	5·0	120·0
Austria	210,000	3·7	46·5
Portugal	200,000	1·0	20·0
Russia	186,000	10·0	?
Roumania	137,000	2·5	19·0
Greece	125,000	2·0	36·8
Germany	119,000	2·6	125·0
Bulgaria	50,000	1·9	?
Switzerland	35,000	1·2	26·2
Servia	30,000	0·6	?
European Turkey	?	2·1	?

This good result is due, as is more clearly shown later on, to the production in certain districts in favourable years of extremely fine wines, which are marketed at the highest prices and cannot be surpassed.

Germany has been far more successful than other European wine-growing countries in fighting against the ravages of phylloxera. The method used is one of extermination. Every vineyard is thoroughly inspected, and all vines found to be infected with phylloxera are destroyed together with those in the immediate neighbourhood, the area thus disinfected not being cultivated for vines for several years. The primary object of this is to confine the evil to such narrow limits that wine cultivation can be afterwards carried on in the old approved manner. This purpose has been accomplished. From 1874 the presence of phylloxera in vine-nurseries, gardens, &c., has been recognised. Its first appearance in the wine-growing districts was on the Ahr in 1881, and it was subsequently discovered in the different wine regions of Prussia, Bavaria, Wurtemberg, Hesse, the Thuringian states, and Alsace-Lorraine. Between 1874 and 1898 a total of about 360 hs was subjected to this exterminatory treatment, that is to say 0·27 per cent of the total wine-growing area has suffered. The cost of this treatment has been 7·5 million marks during twenty-five years, but this seemingly large amount is only 0·23 per cent of the value of the vintages during the same period. Thanks to the vigorous measures taken, German vines have not suffered from phylloxera since. In spite of this favorable result no efforts will be spared in testing all such methods, either of the culture or treatment of varieties of vine not subject to

phylloxera, which can serve to the future progress of vine culture so that the extermination of vines need not be resorted to.

According to the statistics of 1893 the total area of the German Empire covered with vines was 135,210 hs. The areas under cultivation and their yearly yield for the period 1883/1902 are shown in the following table:

Year	Area under cultivation in hectares	Vintage in hectoliters	Year	Area under cultivation in hectares	Vintage in hectoliters
1902	119,922	2,475,699	1892	118,292	1,673,626
1901	119,560	—	1891	119,294	748,462
1900	119,249	—	1890	120,300	2,974,593
1899	117,284	—	1889	120,935	2,021,569
1898	117,279	1,406,818	1888	120,588	2,859,998
1897	117,042	2,775,643	1887	120,210	2,392,042
1896	116,405	5,050,874	1886	120,301	1,503,072
1895	116,137	2,011,637	1885	120,485	3,727,366
1894	116,548	2,824,422	1884	119,974	3,358,017
1893	115,766	3,820,352	1883	120,037	3,195,967

Circumstances affecting the wine culture and wines of the various districts.

On account of variations in the weather, both the quantity and the quality of the vintages vary very greatly in different years; this holds good not only for the various districts, but also for the different localities in each. Owing to these climatic variations, good wine years are not very numerous: the best during the past century were 1802, 1804, 1807, 1811, 1815, 1819, 1822, 1825, 1827, 1834, 1835, 1842, 1846, 1848, 1857, 1858, 1859, 1861, 1862, 1865, 1868, 1874, 1875, 1884, 1886, 1889, 1893, 1895, 1897 and 1900, but these dates do not hold good equally for all districts. The better the quality of the wine, the smaller the yield. Reckoning on the basis of the best quality, one hectare with 14–16,000 vines produces 48 hls of wine per year. In the different wine-growing districts throughout the country, the greatest care is taken when gathering the crop, to separate the grapes according to their quality especially on the larger estates; in this way an excellent vintage is obtained in those years which produce only an average quality of wine. The chief wine-countries of Germany are those in the western provinces, the principal districts being in the neighbourhood of the Rhine and its tributaries. In the northern districts are hill and mountain slopes with southern exposures, which from the favorable conditions of their soil and climate are particularly adapted to the cultivation of the Riesling vine. It is believed that this variety originally grew as wild stock in the valley of the Rhine or of one of its tributaries. In addition to other splendid qualities, it possesses a remarkably fine and charac-

teristic "bouquet," and this too in spite of the various methods of cultivation. It has brought world-wide fame to the German wines, and is to be found at its very best only in the vintages of the chief wine-growing provinces of Germany. The Riesling wine of other countries can scarcely be recognised as a product of the same variety of vine. Climatic and geological conditions alone are not responsible for this difference: to the shaping hand of Nature is added the intelligent observation of the cultivator, and only through the harmonious blending of these two factors can the highest results be obtained. In the chief wine-growing districts of Germany not only is the vine cultivated and tended during the whole year with a solicitude rarely found elsewhere, but in order to obtain the very best material possible the grapes are gathered with a care and punctuality quite unusual in the vineyards of other countries. Here a further element enters into consideration, the skillfulness only gained by experience in carrying out all those wonderful transformations which the grape juice undergoes during and after the process of fermentation in order to bring out to the fullest extent all the valuable properties which mark the finished product.

Germany produces mostly white wines, for which grapes from the Riesling, Sylvaner, Traminer and Gutedel vines are used. Red wines are not made largely, except in some parts of Baden and in the Metzer district.

In point of simple area, the

Wine culture of Prussia

ranks only third among the wine-growing states of the German Empire, 18,316 hs being covered with vines; but in point of the excellent qualities yielded by several of its districts, it is entitled to the first place. The Prussian government owns an area of more than 200 hs,—a larger extent than is owned by any other state of the German Empire. Of these 200 hs, about 100 lie in the Wiesbaden district, the remainder, not yet fully laid out, in that of Trêves. The entire tract is most favorably situated, and may be considered the most valuable wine estate in the world. In 1902 the vineries of Prussia were distributed among the several provinces as follows: Hesse-Nassau (including the Rheingau) 3,196 hs, Rhineland (including the districts of the Mosel, Saar, Nahe, Ahr and the valleys of the Rhine and its chief tributaries) 12,562 hs, Saxony 732 hs, Silesia 1,273 hs, Posen 130 hs, and Brandenburg 372 hs. From the point of view of the wine-trade, only the first two are of real importance.

The Rheingau, lying along the right bank of the Rhine between Schierstein and Caub, holds the first place in the whole world for the value of the wines it produces. The best vintages have lately brought prices never reached before in the open market. The prices per butt (1,200 liters) of 1893 vintage were as follows: Eltville 30,000 marks, Erbach 38,000, Geisenheim 14,020, Hallgarten 15,700, Hattenheim 35,140, Johannisberg 24,020, Kiedrich 20,200, Mittelheim 13,800, Rauenthal 17,100, Rüdesheim 24,000, and Winkel 15,280 marks. To the Rheingau wines belong also those of Hoch-

heim, a small town lying further up the Rhine, close to its confluence with the Main: the familiar term "Hock," an abbreviation of "Hochheimer," is used in England and America to denote all Rheingau wines. In 1893 Hochheimer reached its highest price, 22,060 marks per butt: for the earlier years the following maximum prices per butt are worthy of notice; for the vintage of 1868 in Rauenthal 17,143 marks, Erbach 17,314, and Kiedrich 25,020; for the vintage of 1884 in Erbach 23,980, and Hattenheim 33,460 marks. The highest offers for that of 1895 were, in Erbach 7,340, in Geisenheim 6,000, Hattenheim 9,080, Johannisberg 10,140, and Rüdesheim 7,200:—those for 1897, in Hattenheim 14,640, Rüdesheim 15,080, and Winkel 13,920 marks. The Rheingau wines are characterised by their delicateness and pleasant fruity taste, their generous but mild quality, their richness in body, and their fine bouquet. The diversity which they show in one and the same year delights every connoisseur. Assmannshausen produces the best German red wine from the late-ripening Burgundy grape, which in good years is equal to the best French claret. It is therefore quite easy to understand that in this beautiful district, so richly endowed by nature, the vineyards command very high prices, ranging from 96—120,000 marks per hectare. Based upon an average price from 8—10,000 marks per hectare, the wine-growing area of this small district, 2,315 hs in all, represents a value of from 17 to 20 million marks. In certain parts its wine-growing area has of late increased.

There the Riesling vine thrives on gently sloping hills and the terraced mountain sides in soils of argillaceous slaty character, or of "Cyrenen" marl. In good years 70-80,000 hls of wine are produced, with an average value of from eight to ten million marks. Frankfort-on-the-Main, Mayence, Bingen, Coblenz and Cologne have for many years been important centers of trade for the Rheingau wines. This trade has greatly increased during the past few years, and is even now constantly increasing. Its principal centers are in Rüdesheim, Hochheim, Geisenheim, Oestrich-Winkel, Johannisberg, Eltville, Wiesbaden, and Lorch.

In the Rhineland district of Coblenz, the wine-area under cultivation amounts to 8,424 hs, and that in the Trêves district is 3,963 hs. These districts are remarkable for the extraordinary growth of the Riesling vine in the slaty soil of the Moselle and Saar provinces. This wine is characterised by its pale colour, its lightness, delicacy and freshness, its pronounced bouquet and aromatic flavour, the latter in its better qualities surpassing all other German wines. The market for these wines, as also the price, has greatly increased on account of the development of these specialities. For the same reasons the cultivated area has also been greatly extended, many woodlands having been cleared and laid out as vineyards where the soil was favorable. The average yield of these two districts amounted to 266,986 hls, valued at twelve million marks.

A good idea of the prevailing popularity of Moselle and Saar wines can be obtained from the prices paid for Trêves wines. This is shown by the following figures, in which the net proceeds of each "fuder" (975 liters) are

given. In 1893 Grünhäuser held the first place with 12,750 marks, Piesporter 9,060 marks, Geisberger 8,020 marks, and Scharzhofberger 7,970 marks. In 1895 Scharzhofberger led with 7,050 marks, Bocksteiner following with 7,000 marks. In 1897 Zeltinger heads the list with 9,070 marks, followed by Grünhäuser with 8,610 marks, Piesporter with 8,500 marks, Scharzhofberger with 7,970 marks, and Bernkasteler with 7,530 marks. The total amount of the Trêves sales for the following vintages are of interest.

	Number of "fuder"s	Total value in marks	Average price per "fuder," in marks
1893	1,567·5	5,004,250	3,195
1895	1,012	2,842,300	2,809
1897	816·5	2,786,020	3,412

The last vintage considerably exceeded the average prices, not on account of the quality of the wines, but because the number of markets had considerably increased The chief vineyards lie along the middle part of the Moselle from Trêves to Cochem, and are not only the largest in area, but produce the finest varieties. Other Moselle wines worthy of notice are Josefshöfer, Graacher, Ohligsberger, Karthäuserhofberger and Caseler: somewhat inferior are the Uerziger, Erdener, Kinheimer, Trarbacher, Trabener, Wintricher, Throner, Cueser, Lieserer, Niederemmeler, Winninger, &c. and of the Saar wines the Oberemmeler, Wawerner, Kanzemer, Ayler, &c. The most important centers of the wine trade on the Moselle are Trarbach, Traben, Trêves, Mühlheim, Bernkastel, and Dusemond; of those on the Rhine Coblenz and Cologne are the most noteworthy.

Wine-growing in the river district of the Nahe is quite an important occupation. In the neighbourhood of Kreuznach, the wine-growing area of which has of late considerably increased, the average yield for the years 1893–1898 was 59,670 hls, valued at 1,715,164 marks. The principal vines grown here are the Riesling, Sylvaner, Ruländer, and Traminer; the soil is of gravel and slate with loam or heavy clay. The Nahe wines are partly full and juicy, partly thin, fine wines. Important centers of production are Kreuznach (with Kauzenberg), Roxheim, Niederhausen, Norheim, Münster, Laubenheim, Langenlonsheim, Monzingen, &c.; while Bingen and Kreuznach are the chief commercial centers for the trade in this wine.

The best white wines of what is known as the Rhine valley are Bacharacher, Steeger, Manubacher, and Oberweseler; of the red wines those from Camp, Osterspai, and Hochheim, and, further down the Rhine, those of the Linzer region deserve mention.

On the Ahr, far-famed red wines are produced, chiefly from the late Burgundy vine. The vineyards are mostly on slaty soils, cover an area of 840 hs, and are often laid out in artistic terraces. These wines have a fine aroma and a colour which is more or less beautiful; the chief of them are

from Walporzheim and Ahrweiler, both of which places are at the same time important commercial centers for the traffic.

Bavarian wine culture

covers an area of 25,000 hs, the average area actually under cultivation during the last twenty-five years being 22,189 hs, with a yield of 443,543 hls. In the Rhenish Palatinate, on the plains and sloping hills of the Haardt mountains, much wine is grown. The average yield of wine in the year 1902 on an area of 15,177 hs was 395,749 hls, valued at 11,278,846 marks. Throughout the whole of the Rhenish Palatinate the successful results of the long continued efforts towards perfection in wine culture can easily be seen. Fair wines are produced even in the most unfavorable years, while in good ones all kinds are produced, from the inferior qualities to those which cannot be surpassed. The principal vines are the Riesling and the Traminer, which are planted in the best localities, the Sylvaner, the chief among white grape vines, and indeed the most largely planted vine in this section, the Ruländer (locally called "Tokayer"), and the Gewürztraminer, this last a speciality of the Rhenish Palatinate. The principal wines produced are Forst, Deidesheim and Ruppertsberg. The great value of these wines is shown by the amounts paid per thousand liters for the vintages of several years: that of Ruppertsberg of 1893, for example, brought 12,030, Forst 17,000, and Deidesheim 17,200; of that of 1897, Ruppertsberg brought 7,700 and Forst 7,800. Indeed the 1875 and 1883 vintages of Forst wine brought 13,000, that of 1889 brought 12,600, and Deidesheim of 1889 brought 11,710 marks. Far-famed wines of the midde Haardt mountains are produced in Wachenheim, Königsbach, Ungstein, Dürkheim, &c. In the lower Haardt mountains Kallstadt is the chief center, while the region lying between Neustadt and Landau is noted for the production of large quantities of wine of medium and inferior qualities. The chief centers of the wine trade in the Rhenish Palatinate are Neustadt, Deidesheim, Dürkheim and Landau: enormous quantities are shipped from these places for export.

The average yield for the last ten years in the Franconian wine district was 124,938 hls, valued at 3,598,947 marks, to which Lower Franconia with an area of 6,407 hs marks a noteworthy contribution. White wines which have long been famous are produced in Würzburg, Randersacker, Hörstein, Schloss Saaleck, &c.; these are made chiefly from the grape of the Riesling vine. A form of wine-bottle known as "Bocksbeutel" is a peculiarity of Franconia. Its wines are brought into trade chiefly from Würzburg, Kitzingen, Buchbrunn, Marktbreit and other towns, and are exported thence far and wide.

The Wine culture of Hesse

covers an area of 13,209 hs, of which 679 hs belong to the Bergstrasse, and 12,519 hs to Rhenish Hesse. The average yields of the period 1893/98 were,— 270,239 hls in Rhenish Hesse, and 9,670 hls in the Bergstrasse with a yearly average value of 8,898,000 respectively 337,000 marks. By far the greater part

of this district produces white wines from such vines as the Riesling, Sylvaner, and Ruländer vines, with the exception of Ingelheim and several places in its neighbourhood where a very fair red wine is made from the late Burgundy grape.

Those wines which are made from the Riesling vine grown in the most favored parts of Rhenish Hesse are of extremely fine quality, aromatic, and rich in bouquet. The Sylvaner ripens earlier than the other vines mentioned above, which ensures a uniform quality in the vintages of different years. To this vine are ascribed the chief properties of the wines of Rhenish Hesse, as also its ability to produce a very fair wine even in unfavourable years.

One of the very best of these wines is the fragrant "Scharlachberger" from the neighbourhood of Bingen. Next in order come those of Nackenheim, Nierstein, and Oppenheim, followed again by Laubenheim, Bodenheim and Büdesheim, these latter being the foremost among various other well known wine districts.

The highest prices offered for each butt were: 1893 Scharlachberger 8,100 marks, 1893 Nackenheimer 10,040 marks, 1893 Niersteiner 13,660 marks, 1895 Scharlachberger 5,360 marks, 1895 Nackenheimer 4,000 marks, 1895 Niersteiner 8,000 marks, 1897 Scharlachberger 4,700 marks, 1897 Nackenheimer 13,000 marks, and 1897 Niersteiner 9,800 marks.

The "Liebfraumilch" produced on a small area in the neighbourhood of Worms, is far famed for its delightful quality. Bensheim, Auerbach and Heppenheim produce the well known wines of the Bergstrasse. Mayence and Bingen are the chief commercial centers for the wine trade of Rhenish-Hesse, almost one-half of the amount handled being exported. Worms and Oppenheim also occupy important positions among the towns of the German wine trade. There is also a brisk trade in Bensheim and other towns of the Bergstrasse.

Baden.

In 1902 there were 17,684 hs under cultivation, producing 415,228 hls of wine at a value of 13,007,404 marks. But in certain years far more than a million hectoliters were produced, consisting partly of very good quality wines, and partly of very cheap white and red wines: the total yield for example in 1875 was 1,336,917 hls. The average production of the last ten years was 353,670 hls, valued at 11,386,300 marks. Of this amount 287,910 hls were white wine, 33,070 red wine, and 32,690 Schiller wine, valued respectively at 8,759,505, 1,473,570, and 1,153,230 marks. The vines chiefly used are the Gutedel, Riesling, Traminer, and Sylvaner for the white, and for the red the late Burgundy is the most conspicuous. The wine-growing area has decreased somewhat during the last ten years, particularly in the regions of the Main, the Tauber, and Lake Constance. The Kaiserstuhl, on the other hand, shows an increase: the very fiery wines of this district, grown upon basaltic soil, together with those of Markgräflerland, the Ortenauer and the Affenthaler red wines are famed far beyond the borders of their native land.

Wurtemberg,

with an area under cultivation of 16,826 hs, has during the last few years produced an annual average of 254,014 hls valued at 10,038,139 marks. Up to the present very little of this wine has been exported. The very marked decrease which former years have shown has in the last four years ammounted to only a very low percentage. More of the ordinary table wines are produced than fine wines, and more white than red and Schiller wines. The largest wine-growing area is the district of the middle and lower Neckar, the chief places being Cannstatt, Fellbach, Heilbronn, Lauffen, Neckarsulm, Stuttgart, and Weinsberg.

Alsace and Lorraine,

showed in 1902 an area of 31,138 hs actually under cultivation of which 10,971 hs lay in Upper and 14,360 hs in Lower Alsace, and 5,807 hs in Lorraine. The average yearly yield for the period 1893–98 was for Alsace 738,262 hls, value 18,151,211 marks—for Lorraine 173,438 hls, value 464,826 marks. In Alsace-Lorraine the average yield for 1875-97 was nearly one million hectoliters; the highest yield was in 1875 amounting to 2,059,293 hls—the lowest, in 1880, due to heavy frost, only came to 208,000 hls. For the so-called "noble vintages" the Riesling, Edler, Traminer, Kleuner, and Muskateller vines are planted; for ordinary vintages, the Gutedel, Kniperle, Sylvaner, Elbling, Räuschling, Trollinger and Olwer. The best qualities of white wine are produced at Reichenweier, Rappoltsweiler, Heiligenstein, Wolxheim, Molsheim, Türkheim, Thann and other places, but these are very little exported. Delicious table wines are an important production of Alsace, and are to be found in great quantities and in numerous districts, the best of which lie along the mountain ridge from Thann to Marlenheim. The fine varieties of red wines, which are however only exceptional productions, come from Türkheim, Kaysersberg, Reichenweier, Rappoltsweiler, Rodern, St. Pilt, Ottrott, and St. Leonhard. Wine culture is far advanced in Alsace, but too little attention has hitherto been paid to the commercial side of the question and to the treatment of the wine: in the last ten years however, a noticeable improvement has been made in these respects. Lorraine produces chiefly red wines, especially table wines made from the Burgundy, Müller and Gamay vines. The white wines are made from Ruländer, Elbling, and occasionally, Riesling grapes. Practically all the wines of Lorraine are sold for local consumption, and in most years the supply is not equal to the local demand. A considerable quantity of grapes have been sent to the German manufactures of sparkling wines during the last twenty years, being well suited to this branch of the industry. It is estimated that about 25,000 hls are annually produced.

Of other German states, the

Kingdom of Saxony

has a wine area of 340 hs, and the

Thuringian States

a total of 194 hs. Their products however, are of quite minor importance.

The German Wine Trade.

The German wine trade is in a very flourishing condition, and occupies quite an important position in the commerce of the world, its foreign markets having considerably increased of late years, as is shown by the following statistics.

Imports and exports of new wines, dry and sparkling wines.

Year	Wine and cider in barrels		Wine in bottles		Sparkling wine	
	Quantity in double centners	Value in thousand marks	Quantity in double centners	Value in thousand marks	Quantity in double centners	Value in thousand marks
Import						
1903	719,118	34,220	6,923	1,108	22,199	4,995
1902	733,187	35,061	6,567	1,054	20,026	4,506
1901	775,199	35,601	7,313	1,206	15,785	3,552
1900	752,999	38,099	7,882	1,311	42,083	9,469
1899	715,903	36,928	6,697	1,113	27,891	6,275
1898	679,501	35,008	6,691	1,108	26,779	6,025
1897	668,620	34,709	7,827	1,317	24,567	5,528
1896	636,923	33,248	7,806	1,418	23,254	5,252
1895	673,694	34,889	6,382	1,293	21,321	4,797
1894	705,870	34,713	6,613	1,327	18,506	4,164
1893	755,391	36,127	7,126	1,452	19,745	4,443
1892	821,733	42,097	7,723	1,552	19,134	4,305
1891	697,115	39,929	8,914	1,842	22,717	5,111
1890	708,022	37,844	7,780	1,479	21,330	4,266
1889	717,761	43,066	8,083	1,212	19,682	3,936
1888	650,555	31,227	7,579	1,137	15,602	3,120
1887	555,495	27,775	7,075	1,061	16,109	3,254
1886	535,220	29,437	7,419	1,113	15,917	3,343
1885	540,973	29,753	7,362	1,104	25,829	6,199
1884	537,368	33,317	8,462	1,269	38,439	9,225
Export						
1903	131,495	9,770	82,220	10,195	20,612	2,267
1902	127,703	9,488	79,397	9,882	19,971	2,197
1901	128,915	9,595	80,474	10,145	19,590	2,155
1900	141,220	9,847	80,766	10,784	20,450	2,188

Year	Wine and cider in barrels		Wine in bottles		Sparkling wine	
	Quantity in double centners	Value in thousand marks	Quantity in double centners	Value in thousand marks	Quantity in double centners	Value in thousand marks
	Export					
1899	134,039	9,236	79,834	10,616	18,277	2,065
1898	130,640	9,018	79,651	10,984	18,011	2,035
1897	134,776	9,018	76,872	11,186	16,035	1,812
1896	132,642	9,228	71,283	10,420	18,203	2,057
1895	121,500	8,826	64,945	10,244	17,072	1,929
1894	114,371	7,905	56,691	8,835	15,205	1,870
1893	122,808	8,435	59,007	9,304	16,282	2,003
1892	124,392	8,489	58,346	9,156	17,232	2,120
1891	117,397	8,670	56,507	8,665	17,664	2,173
1890	125,451	8,048	52,450	8,235	15,820	1,740
1889	94,278	7,072	47,338	8,047	15,235	1,676
1888	119,739	8,980	43,386	7,376	15,740	2,046
1887	112,409	8,431	46,955	7,982	15,750	2,048
1886	201,275	15,096	45,111	7,669	13,400	1,742
1885	144,779	10,858	44,251	7,523	13,753	1,788
1884	106,784	8,009	50,287	8,549	13,812	1,588

Exports to the chief markets.

	1903	1902	1901
	Quantities in double centners		
Wine and cider in barrels.			
United States of North America	38,872	35,166	35,510
Great Britain	21,814	22,547	22,118
Belgium	19,719	18,360	20,271
Switzerland	16,999	17,725	13,810
Holland	10,071	11,369	10,934
Russia	6,950	6,034	6,224
Austria-Hungary	4,066	3,433	3,628
France	3,862	4,023	5,946
Sweden	2,136	2,122	2,527
Denmark	1,699	1,604	2,194
Finland	1,538	1,439	1,906

	1903	1902	1901
	Quantities in double centners		
Wine in bottles.			
Great Britain	23,783	24,036	23,146
United States of North America	22,911	21,501	19,369
Holland	8,308	8,057	8,311
Austria-Hungary	3,282	3,207	3,111
Free port of Hamburg	2,521	2,160	2,598
Belgium	2,377	2,224	2,409
France	2,030	1,796	1,597
Sweden	1,822	1,813	1,917
Russia	1,648	1,355	1,376
China	1,363	1,605	3,496
Sparkling wines.			
Great Britain	9,717	9,605	10,074
Belgium	2,358	1,672	1,500
United States of North America	1,621	1,693	1,392

The Manufacture of sparkling wine.

Beginning in the first third of the last century on a very small scale, the German manufacture of sparkling wines has developed in the following two-thirds most remarkably. The method used is the same as that in Champagne—fermentation in the bottle. The total annual production amounted in 1840 to a quarter of a million bottles, in 1850 to a million and a quarter, in 1878 to four million, in 1886 to six million, and at present amounts to no less than ten million bottles. This increase grows larger yearly, for not only are the products sold in greater quantities for home use, but the export trade has also greatly increased. The sparkling wines which are most exported are those from the Rhine (Sparkling Hock), from the Moselle (Sparkling Moselle) and the sparkling wine made from various red wines of Germany. These are chiefly sent to Great Britain and the colonies.

The German sparkling wine industry is yearly making greater strides towards perfection in its products. It has brought itself to the front by the careful selection of different varieties of wine to suit the varying tastes of the consumers. The unwarranted prejudice which formerly existed against German sparkling wines has now almost entirely disappeared, and distinctions of various kinds have been showered upon them, especially by the committees of award at the largest world-expositions. Full honour was done them in 1867 at Paris; and in 1876 at Vienna the French themselves confessed

that several of the inferior German sparkling wines were better than the inferior French wines, while the better qualities were placed level with the best wines of France. They received also high praise at Sidney, Melbourne and Chicago. Sparkling wines are produced for the most part on the Rhine, the Main, and the Moselle.

H. W. Dahlen.

FORESTRY IN THE GERMAN EMPIRE.

1. Size and Distribution of Forests.

Germany has a forest area of 13,995,868·5 hs, comprising 25·89 per cent or a full quarter of the total area of the country, and in respect to afforestation stands above Norway (24 per cent), France (17 per cent), Spain (17 per cent), Belgium (13 per cent), Italy (12 per cent), the Netherlands (7 per cent), Denmark (6 per cent), Great Britain (4 per cent), but is exceeded by Finland (56 per cent), Bosnia (53 per cent), Russia (37 per cent), Sweden (34 per cent), and Austria-Hungary (31 per cent).

The distribution of the forests varies on account of the natural conditions of climate and soil, and by artificial ones such as the development of economic conditions, laws and civilisation. From east to west, Germany lies wholly within the natural limits of timber-growth; in a direction running north and south only some few mountain chains rise above this. Conditions of soil permit the growth of trees everywhere. Even in the poorest positions, in the sandy parts of the plain and the shallow earth of the mountains, the hardier species of timber, especially fir and pine, find sufficient inducement to thrive. Thus in the course of centuries, the actual distribution is decided by artificial influences such as the density of population, the growth of property and legal relations, and the development of traffic. Afforestation is generally less in districts where the soil is more level and fertile and therefore devoted to agriculture, or where the population is denser and traffic more extensive.

Without regard to the political division of the Empire into 26 separate states, we may distinguish the north German plain district, or 49 per cent of the whole forest-area, with fir as the chief species of wood, the secondary

mountain and hill-country of central Germany with pine and beech predominating, 22 per cent of the forest-area, and the south German district with beech, pine and pitch-pine, 29 per cent of the forest-area. The afforestation of the separate states is given in the following table:

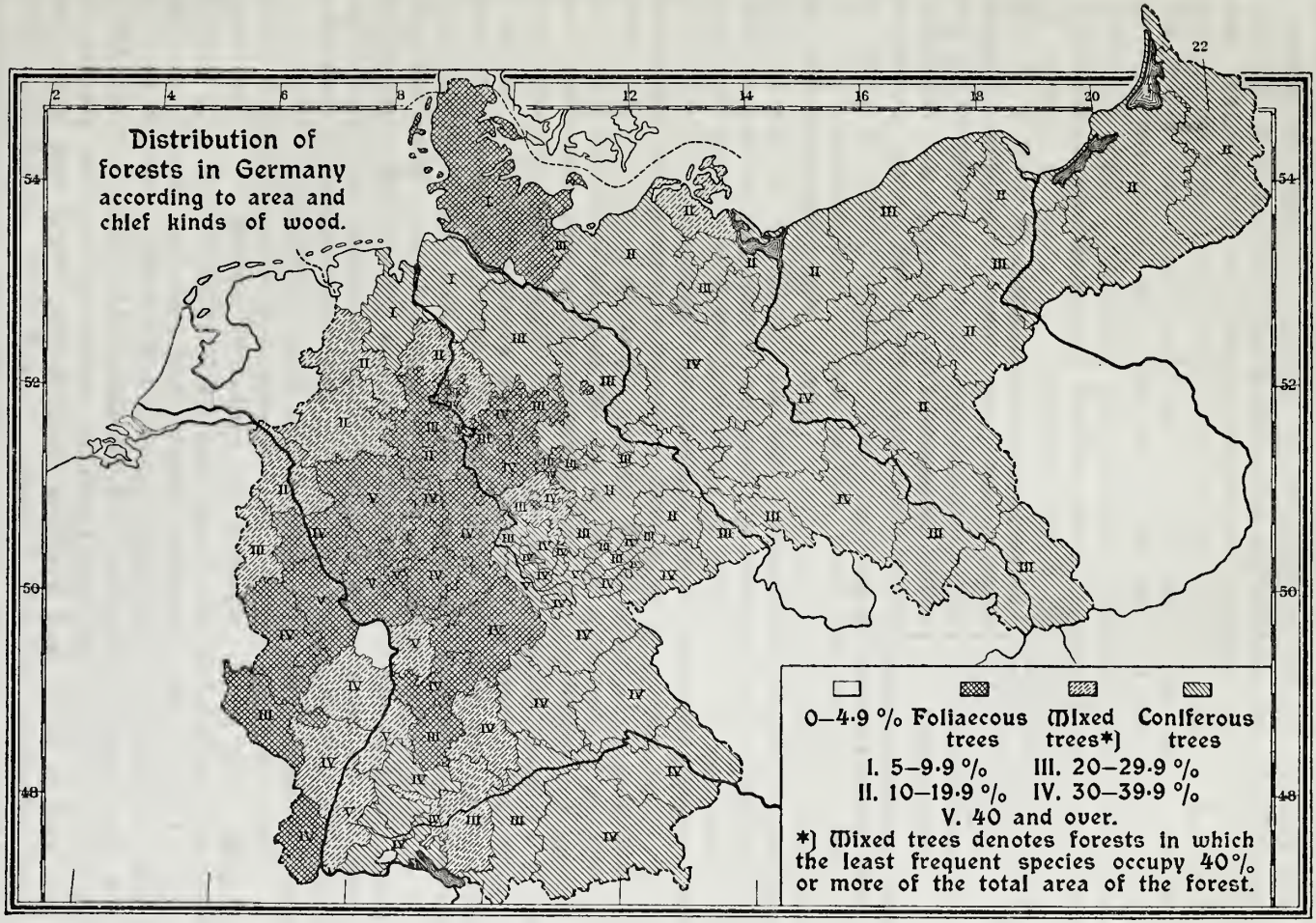
States	Total Area hs	Forest hs	Percentage of the Total Area	Per head of population hs
Prussia	34,864,865·8	8,270,133·5	23·72	0·24
Bavaria	7,586,993·4	2,466,553·3	32·51	0·39
Saxony	1,489,806·9	384,539·9	25·81	0·09
Wurtemberg	1,950,595·0	600,415·0	30·78	0·28
Baden	1,508,100·0	567,795·0	37·65	0·30
Hesse	769,897·9	240,009·0	31·17	0·21
Mecklenburg-Schwerin .	1,316,162·0	236,739·7	17·99	0·39
Mecklenburg-Strelitz . .	292,950·0	62,225·0	21·24	0·61
Oldenburg	642,735·5	68,341·3	10·63	0·17
Brunswick	364,122·0	109,473·3	30·06	0·24
States of the Thuringian District	1,462,939·2	460,710·6	32·49	0·27
The Smaller North-West German States	364,312·5	89,101·1	24·46	0·07
Alsace-Lorraine	1,451,304·7	439,831·8	30·31	0·26
German Empire 1900 . .	54,064,784·9	13,995,868·5	25·89	0·25
„ „ 1893 . .		13,956,827·3	25·82	0·28
„ „ 1883 . .		13,908,398·4	25·74	0·31
„ „ 1878 . .		13,872,926·1	25·75	0·32

Arranged according to the three principal districts, the afforestation of north Germany is 21·37 per cent, of central Germany 31·89 per cent, and of south Germany 32·61 per cent.

2. Ownership.

The whole forest-area in the German states is owned as follows: by the Ruling Houses 257,302 hs or 1·8 per cent, by the State 4,489,883 hs or 31·9 per cent, by the communities 2,258,090 hs or 16·1 per cent, by Institutions 211,015 hs or 1·5 per cent (7·19 million hectares or 51 per cent is public property), by societies 306,214 hs or 2·2 per cent, property in trust 1,446,664 hs or 10·4 per cent (in tied but not public property 1·75 million hectares or 13 per cent), by independent private owners 5,056,701 hs or 36·1 per cent.

Large estates surpass the total of the small in extent. They offer the greatest security for a systematic permanent revenue, especially when they take the form of trusts in the hands of public associations and legal representatives. 64 per cent of the forest is tied property, and 36 per cent un-


Distribution of forests in Germany according to area and chief kinds of wood.
0—4·9 % Foliaecous trees
Mixed trees*)
Coniferous trees
I. 5—9·9 %
II. 10—19·9 %
III. 20—29·9 %
IV. 30—39·9 %
V. 40 and over.
*) Mixed trees denotes forests in which the least frequent species occupy 40% or more of the total area of the forest.

-fettered private property. For purposes of management the forest is divided into 953,875 units (enquiry of 1895), of which 22,041 are purely for afforestation and 931,834 in combination with agriculture. According to size the forests are divided as follows: on estates of under 10 hs 89·9 per cent or 11·8 per cent of the area; on estates from 10 to 200 hs 9·2 per cent or 19·7 per cent of the area; from 200 to 1,000 hs 0·7 per cent or 19·4 per cent of the area, 1,000 to 5,000 hs 0·2 per cent or 34·2 per cent of the area; over 5,000 hs 0·03 per cent or 14·9 per cent of the area. Thus 80 to 90 per cent of the total area is on a scale suitable for independent management. Most of the small estates are in west Germany.

3. Species of Wood and Manner of Cultivation.

The variety of wood-species in Germany is not large. Among the numerous indigenous kinds which formerly existed, in consequence of the economic management of forests which was introduced in the middle of the eigtheenth century, only those have been preserved, which possess a high economic value, viz., of the foliage trees, chiefly oak and beech, over an area of 1 million hectares, in all of which however 0·45 million hectares are planted with bark-wood. This is most grown in the tall timber-woods and plantations on the lower Rhine and in Westphalia; its cultivation is declining, because the ground suitable for it is devoted more and more to agriculture, but it is grown abundantly in mixed woods along with fir and beech trees. Bark-wood is likewise declining in extent because it pays still worse on account of the low prices for tanning-bark. It is found chiefly in west and south Germany. The beech, (Fagus silvatica L.,) formerly much grown for fuel, has with the spread of coal-mining almost entirely lost its importance and is more and more displaced by the better paying conifer. It is most widespread in west Germany and in the chalk-ground of the south German mountains, and is moreover abundantly represented in the north, especially on the shores of the Baltic from Schleswig-Holstein to Pomerania. Wherever it is further cultivated on account of its good forest qualities, valuable species of wood, chiefly oak, but also maple, (Acer L.) and ash, (Fraxinus Tourn.,) as well as conifers are grown along with it. In many places also horn-beam, (Carpinus L.,) elm, (Ulmus Tourn.) are planted with it, and such soft-woods, as aspen, poplar, (Populus L.,) and, more seldom, lime. The unpretending birch, (Betula L.) is seen everywhere. Finally the alder, (Alnus Tourn.) is cultivated as underwood in damp low ground. The beech, including the hard-wood species of foliage-trees, covers about 2 million hectares, the soft wood 0·3 million hectares, the foliage-tree mixed forest about 1·2 million hectares, and osier-beds 36,000 hs. The total area covered by foliage trees amount to 4·5 million hectares or 32·5 per cent of the whole forest area, 67·5 per cent or 9·5 million hectares, being covered with conifers. The most important species of the latter are the fir and pine, and in south west Germany the pitch-pine, mixed with larch. The fir, (Pinus sylvestris L.,) the chief species of wood in the sandy plain, covers 5·6 million hectares. It thrives best in the dry districts of north east Germany

(the East Prussian fir is highly valued) but flourishes also in those districts which have a considerable rainfall, i. e. in the west and on the plateaus of central Germany from Nuremberg to the Palatinate, and with careful treatment yields great quantities of wood, even in the hill and mountain country although generally of inferior value. According to the locality beech and oak, pine and larch, birch and soft woods are frequently grown with it. The pine, (Picea excelsa Lk.,) forms the great forests which cover the mountains of middle and southern Germany, but from ancient times it has also been a native of the plains of East Prussia, Silesia, and Hanover. It covers 2·5 million hectares, and will continue to increase because it is hardy, easily cultivated, gives a high yield of timber in a relatively short time, and is therefore preferred in new afforestation and as a substitute for the economically inferior foliage-tree. The pitch-pine, (Abies pectinata DC.,) is usually grown in the Black Forest and the Vosges, but occurs everywhere in mixed woods except in the north east. It occupies an area of 0·3 million hectares. The larch, (Lacix europaea Will.) is everywhere found mixed with the chief species of wood, mostly in the mountains where it is at its best.

Of the typical kinds of forestry, tall-timber predominates throughout; about 11 million hectares or 78·5 per cent are thus planted, 56 per cent with foliage trees, and 89 per cent with conifers. Bare clearing with artificial renewal is the general rule for fir and pine, seeding-in with natural renewal, for foliage-trees and pitch-pine. The cultivation of tall timber demands long periods of management, great areas of cultivation, systematic arrangement, and constant care, but yields most wood and is the most valuable per area. Low woods on the contrary cover only 1·4 million hectares or about 9·6 per cent. 7 per cent of foliage trees, and 11 per cent of conifers, and permit of the permanent cultivation of a small area, but yield less and less valuable wood, and are to be found in the small estates of Westphalia and the Rhine, and as far as conifers are concerned in the east. Middle-sized timber is still more sparsely represented as it amounts only to 5 per cent. The low wood occupies 6·8 per cent of the forest-area, and consists chiefly of 3·2 per cent of oak bark-wood in Westphalia and the Rhine provinces (34 per cent) but also in Bavaria, Baden, Hesse, and Hesse-Nassau. Moreover this form of cultivation is found everywhere, especially on independent small estates, in the east in fir forests as alders, in the west frequently intermingled with wood for agricultural use, as so-called hill felling-wood.



4. Timber Yields.

The yields are greatest in the tall timber woods, in conifer woods and in the state forests, smallest in the low woods and in independent private forests. The total production will gradually increase because continued afforestation is taking place and the cultivation of tall conifers extending, and because at present younger trees are the most prevalent in the conifer high-wood, 48 per cent of the area being of under 40 years growth, 33 per cent from 41 to 80 years growth and 16 per cent over 80 years. In the foliage wood on the other hand these three grades are approximately equally divided.

According to the statistics of 1900 the German forests produce annually about 20 million "fest-meter" (1 c.m. = 1 cubic metre solid wood) of timber, and 18 million c.m. of firewood, making a total of 38 million c.m. of solid wood (or wood of over 7 centimeters diameter) or of the solid wood 53 per cent timber, 47 per cent fire-wood, in addition to 10 million c.m. of loppings and roots and 135,000 c.m. (1 million d.z.) of oak bark and 101,000 c.m. of osiers.

South Germany yields the most solid wood, especially large timber, namely from about 4 million hectares, 14·6 million c.m. or 3·6 c.m. per hectare, thus 39 per cent of the total quantity, from 29 per cent of the total forest area, whilst North Germany produces 42 per cent of the total quantity on 49 per cent of the total area, and Germany 25 per cent of the quantity on 22 per cent of the area, or 2·4 c.m. per hectare. The pine forests in Saxony and Thuringia attain the highest average of timber, about 75 per cent of the content of the solid wood, the beech forests the lowest. The state forests with proportion of 32 per cent of the area yield 43·5 per cent of the whole timber and 40 per cent of the total solid wood products, the independent private forests on the other hand with 36 per cent of the area yield only 25·7 and 26·6 per cent.

5. Administration and Regulation.

By far the greater part of the German forests are regulated and subjected to a systematically ordered administration, the underlying principle of which is to fell only as much wood annually as is renewed in the growth. This aims at bringing the increase of valuable wood to a maximum. For this purpose different scientific and practically tested methods are employed. Those species of wood are reared which in a given locality produce the greatest economic value. Besides woods of only one species, the planting and rearing of mixed forests is attempted. The principal methods of rearing are thinning in the earlier stages (the age of thickening) and in the older (pole timber) stage, and clearing in the advanced (timber wood) stage; by removal of badly grown, malformed, and valueless trees and of the unwished for species of mixing woods, strong and well-formed timber is continually produced, and the rate of growth of the property is raised. At the same time a first yield preceding the plantation yield is attained to the advantage of the forest-revenue. The instruction in thinning has been especially developed latterly in various directions and brought more in practice, and very successfully.

6. Forest Education, Instruction, Advocacy.

All these methods and regulations are only practicable when those who are to carry them out have been well and scientifically trained in the practice and theory of forestry. To do this has been one of the first cares of the forest authorities of the Federal States in the interests of their forest-economy. The forest state management in Germany has for centuries past been a model for and characteristic of the science of forestry. Several high schools exist at which

the future state forestry officials are educated in forestry mathematics, law and natural science, but which also stand open to others, and are visited by numerous students from at home and abroad. At the same time they have become nurseries for the advancement and development of forestry and the auxiliary sciences. There are schools of forestry in Prussia at Eberswalde and Münden, the High School at Aschaffenburg and the University of Munich in Bavaria, the school of forestry at Tharandt in Saxony, in Wurtemberg the University of Tübingen, in Baden the Technical High School at Carlsruhe, in Hesse the University at Giessen and for the Thuringian States the College at Eisenach, besides which lectures on forestry are held at the Agricultural High Schools in Berlin, Bonn and Halle. At the nine institutions we have named there are 32 lecturers on forestry, 83 other lecturers for the education of forest-keepers, and numerous assistants. All the institutions are furnished with abundant means of teaching, with libraries, collections, botanical and experimental gardens, and sometimes special teaching districts are assigned to them. The total number of students of forestry amounted within the last few years to between 400 and 450, of whom about 250 were candidates for the State Forest Service. For the Lower Forest Service also, different schools exist in the various states for theoretical instruction, as in Prussia, Bavaria, Wurtemberg, Baden, Hesse, and Meiningen.

The trial of new methods and the improvement of the existing ones is the work of the German Board of Experimental-Forestry, which is controlled by the Union of German Experimental-Forestry Institutions with its seat at Eberswalde. To it belong nine experimental institutions in Prussia, Bavaria, Saxony, Wurtemberg, Baden, Hesse, Brunswick, Thuringia and Alsace-Lorraine. The united interests of German Forestry are represented by the "German Forest-Union," the permanent organ of which is the German Forest Council. At present about 2,000 members belong to the Union. 20 Forest Unions exist besides for separate countries or parts of a country. Finally there is a burial club for foresters, a union of private forest-officials of Germany, &c.

7. The significance of the Forest to the Public.

The national value of the forest, its capacity to produce necessary goods economically, to provide opportunity for remunerative labour, to favourably influence the cultivation of land and to employ certain kinds of ground usefully, has made it from ancient times an object of solicitude for the state. The legislation referring thereto, which is very different in the separate states, is specially directed towards the preservation and foundation of enclosed forests and to the recultivation or planting of waste tracts. In the first place the State and other public authorities acquire waste land and plant it. Private efforts are supported actively by means of subsidies and loans from public funds, by information, advice, and by the state authorities which take charge of the management. According to the report of 1900 there are in the

whole of Germany 545,000 hs, of waste land fit for planting and inferior pasture land, i. e. about 4 per cent of the forest area and 1 per cent of the total area.

8. The wood trade and its requirements.

In spite of its noteworthy home production of wood, to the extent of about 38 million c.m. of which 20 millions c.m. is solid timber, Germany is no longer in a position to supply its own wood. The industrial development of the Empire and the rapid increase of population constantly demand more wood. The additional imports of wood, expressed in cubic-metres of timber, amounted in 1886/90 to about 4·5 millions, in 1891/95 to 5.5 millions, and in 1896/1900 to 8·6 millions. The total consumption thus amounts now to about 29–30 million c.m. or 17–18 million, or 0·54 c.m. per head of the population against 0·38 in 1886/90 and 0·40 in 1891/95. The inference is justified that with a continuance of the present rate of development of the Empire the requirements will still increase, and that the assured growth in the existing home-production of wood will not suffice to meet them. The efforts to change this as much as possible by increasing the timber forests, raising the capacity of production and improving the proportion of timber, are therefore amply justified.

Germany receives most wood from Austria-Hungary, Russia, Finland, and Sweden, and also large quantities from the United States of North America. The chief articles of import, in value about 200 million marks, are shown in the following summary: the export of wood is smaller, and amounted in the last five years to 6–7 million "double centners" at a value of 40–70 million marks.

Imports into Germany.

	1900		1901	
	Tons	Million marks	Tons	Million marks
Timber in the log	2,627,327	104·3	2,451,143	59·3
from Austria-Hungary	1,578,295		1,377,831	
„ Russia	989,570		1,019,222	
„ U.S. North America	198,322		123,428	
Timber in the balk, trimmed	673,846	40·4	553,127	23·9
from Austria-Hungary	230,752		166,039	
„ Russia and Finland	382,702		319,054	
„ Sweden	48,334		33,698	
„ U.S. North America	8,125		7,397	
Sawn timber and planks	1,642,551	131·4	1,336,699	87·0
from Austria-Hungary	507,473		384,189	
„ Russia and Finland	296,939		282,293	
„ Sweden	477,326		380,703	
„ U.S. North America	256,878		223,936	

	1900		1901	
	Tons	Million marks	Tons	Million marks
Oak staves	52,893	6·7	45,094	5·4
from Austria-Hungary	32,317		25,335	
„ U.S. North America	16,325		15,458	
Other Timber	33,764	8·1	53,382	10·5
Wood-bark and Tanners' Bark	101,100	8·9	102,632	9·2
from Austria-Hungary	63,929		66,073	
Polished wood and wood for cellulose manufacture	148,354	3·0	204,009	5·1
Fire-wood	193,914	2·9	173,995	2·4
Charcoal	23,517	1·4	26,305	1·6
Quebracho	17,374	6·5	118,836	7·9
	1902		1903	
Log timber, rough	1,947,592	54·3	2,463,250	68·8
from Austria-Hungary	1,152,018		1,311,555	
„ Russia	739,971		1,087,543	
„ U.S. North America	26,552		20,763	
Balks, trimmed	448,410	22·9	524,617	26·7
from Austria-Hungary	127,065		155,818	
„ Russia and Finland	263,123		302,296	
„ Sweden	46,560		53,545	
„ U.S. North America	6,159		7,314	
Sawn wood and planks	1,447,648	92·4	1,729,528	107·6
from Austria-Hungary	387,988		478,796	
„ Russia and Finland	293,424		390,085	
„ Sweden	439,678		452,015	
„ U.S. North America	241,188		316,583	
Oak staves	33,771	4·1	32,189	3·9
from Austria-Hungary	20,786		19,364	
„ U.S. North America	7,618		7,076	
Other Timber	56,288	12·3	48,730	10·8
Wood-bark and Tanners' Bark	101,271	9·0	103,757	9·2
from Austria-Hungary	66,311		68,928	
Polished wood and wood for cellulose manufacture	173,149	4·0	220,042	5·1
Fire-wood	167,085	2·3	140,898	1·9
Charcoal	23,089	1·2	16,987	0·8
Quebracho	143,642	8·8	115,916	7·1

F. Jentsch.

GERMAN MINING.

Amongst all the various branches of German industry, Mining ranks as one of the first. Its importance is certainly far too little appreciated, because the mines are confined to small districts of Germany, and lie moreover mostly out of the way of the usual routes. The most reliable standard by which to estimate the economical importance of any branch of industry is unquestionably the value of its productions.

This method is unfortunately not always practicable, because comparative statistics including reliable statements as to value are unobtainable in most branches of industry. Even were it possible to obtain such of a single country, as is being done at present in Germany for commercial and political purposes, detailed comparison with other countries would still be infeasible, as no understanding has been arrived at as yet about the common principles to be respected when making such calculations. It is therefore necessary in the first instance, to fall back on a comparison between the number of workmen employed in the various branches of industry. Such a comparison would be still more valuable if the wages earned by the persons employed were compared and not their number, for this would give an insight into the powers of consumption of an industry. Even then considerable variations would arise, according to whether the branches of industry concerned were occupied in the production of raw or worked up materials. A proportionately larger number of workmen are employed in the raw material industries than in the manufacturing industries where the number is smaller and the other factor of production, the supply of raw materials and partly manufactured products more prominent. If these differences are taken into account, a definite idea can be formed of the importance of the various branches of large

German industries from the figures furnished by insurance statistics. Not only insurance against illness, disablement and the consequences of old age for the entire German working classes, but also insurance against accidents is due to the legacy of the great Emperor and his Chancellor. The latter kind of insurance offers the most reliable basis for comparison, whereby it must naturally be borne in mind that the amounts paid on wages exceeding more than 1,500 marks per year are only calculated at a third. More than half the German miners and smelters receive wages above the amount just mentioned, and always in cash, paid after the subtraction of the amount payable for the assurance against illness and old age; the burden of assurance against accidents is borne by the employers themselves.

Smelting is very closely connected with mining, and more so with the working and making of iron and steel. These industries, which, taken collectively form part of the mining industry, cannot be treated here, although the figures appertaining to the iron industry must not be omitted, because in both of the closely connected industries the most important supports of German industry are embodied.

The figures for 1901 (the last year for which statistics are available) were:

a) Industrial accident insurance: 483,578 establishments 6,884,000 workmen with a wage list of 5,533,392,000 marks;

b) Miners' associations included in the above: 1,929 works (0·4 per cent of the total number) with 607,000 workmen (8·8 per cent of the total number) and wage list of 706,737,000 marks (12·8 per cent of the whole amount);

c) Further, the seven co-operative associations of the iron and steel trade: 26,217 works (5·4 per cent of the total number) with 789,000 workmen (11·5 per cent of the total number) and a wage list of 787,838,000 marks (14·2 per cent of the total amount);

d) Total of b and c together, German mining industry: 28,146 works (5·8 per cent of the total number) with 1,397,000 workmen (20·3 per cent of the total number) and a wage list of 1,494,574,000 marks (27·0 per cent of the total amount).

The small number of works in the mining industry as compared with the total number of the works contributing to the industrial accident assurance, taken together with the percentage of the workmen employed, points to the fact that mining and smelting are the most important of the large industries in Germany; but the figures show still more clearly, that the workmen in mining and smelting have a far greater share in the amount of wages paid than their numbers would lead one to expect. A complete change has taken place in the economical importance of the individual branches of the mining industry. Formerly mining was necessarily limited by the difficulty of traffic to very expensive means of conveyance. The working of rich ores was in earlier times the sole field for mining activity. Owing to the inadequacy of the machinery obtainable, the chief enemy of mining was at that time the inrush of water; people therefore always used to try to work beds

on sloping ground which afforded natural outflow for the water by means of adits.

This work was consequently always limited to hilly ground; hence the German term for mining, which literally translated means "hill-industry." Although we read in very early times of coal being obtained, yet it is hardly a century ago that the coal industry, for instance, in the most important mining district of the whole of Europe, in that of the Ruhr, attained any noteworthy proportions.

The transformation undergone in all means of communication by the introduction of railways opened up undreamed of markets for the coal industry. This development caused German coal mining to flourish and become one of the most important branches of industry. Its prosperity was also considerably enhanced by the passing of judicious mining laws, which most of the Federal States, in imitation of Prussia, introduced in place of a number of narrow minded regulations.

Unfortunately no comparative statistics concerning German mining produce and its value were made before the establishment of the Empire; for this reason it may be interesting to draw up some data respecting the prosperity of coal mining dating from a century ago.

The following figures show the state of the coal mining industry in the district supervised by the Dortmund board of mining:

1	2	3	4	5
Year	Number of works	Amount of produce in 1,000 tons	Value of produce in 1,000 marks	Workmen (including officials)
1792	154	177	684	1,357
1800	158	231	1,039	1,546
1830	172	571	3,368	4,457
1850	198	1,666	10,385	12,741
1870	220	11,813	67,626	51,391
1890	175	35,469	282,442	127,794
1895	157	41,146	273,933	154,702
1900	164	59,619	508,797	226,902
1901	162	58,448	512,185	243,926
1902	164	58,039	486,775	243,963
1903	166	64,690	535,684	255,992

These figures speak volumes; although the number of works has not undergone any appreciable change, and has if anything diminished owing partly to amalgamation, the number of workmen employed has increased almost 190 fold, the amount of output about 365 fold and the value 783 fold since the year 1792.

The whole of the productions of the German mining industry together, in the short period of time that has elapsed since the foundation of the Empire, cannot show such an enormous advance as the above; and still coal-mines have been continually increasing during the last few decades. The following figures refer to the German Customs' Union, including the Grand-Duchy of Luxemburg:

1	2	3	4	5	6	7
Year	Total value of mining produce in millions of marks	Value of				Share of columns 3–6 in column 2
		Bituminous coal	Brown coal	Iron ore	Potassium salts	
		percentage				
1871	314	69·5	8·3	9·8	1·1	88·7
1880	376	65·4	9·8	9·2	1·8	86·2
1890	726	74·1	6·9	6·6	2·3	89·9
1895	706	76·3	8·2	5·8	2·9	93·2
1900	1,263	76·5	7·8	6·1	3·1	93·5
1901	1,314	77·3	8·4	5·5	3·3	94·5
1902	1,236	76·9	8·3	4·4	3·2	92·8

According to these figures the value of the products of the German mining industry amounted in 1902 to over a milliard marks; this rapid rise in value can only be ascribed to the protection of a powerful and peace-loving government which enabled the mining industry to enjoy uninterrupted prosperity. The above represent the most important progress made in the German mining industry; the other manifold branches of the ore industry also comprise very important undertakings which cannot be dwelt on here.

More than four-fifths of this value is relative to the coal industry, and about three quarters is due to bituminous coal. From the district of the Ruhr alone, which is only a few hundred square kilometers in extent, about one half of the total German bituminous coal products are drawn; next in importance rank the districts of Silesia, along the Saar and near Aix, and then come the kingdoms of Saxony and Bavaria.

The latter two, in conjunction with the duchy of Saxony-Altenburg, are of considerable importance as regards the most recent branch of coal production, namely of brown coal. In this branch too the kingdom of Prussia leads the way. The industry has developed very much of late years, especially in the provinces of Saxony, Brandenburg and along the Rhine. Originally the first place was held by lignite used for the manufacture of paraffin, but lately this product, which was formerly dependent on the surroundings of the mines for its markets, has been almost exclusively manufactured into coal bricks, so as to render it more easy of transport.

Slack too, which is very poor in gas, has been utilised similarly with very good results; the most important use to which bituminous coal has

been put is that of forming it into coke, which is irreplaceable for many smelting processes in the present state of technics. In 1902 more than 12,000,000 tons of coke were manufactured in the German Empire, nearly three quarters coming from the Ruhr district. Here, especially since the beginning of the last decade, secondary works have been established in connection with the produce of coke, having as their object the production of tar and benzol from the coke furnace gases.

The surplus of these gases was turned to account, up to a short time ago, for producing steam power by heating boilers. For some years past, however, trials have been made to utilise the gas escaping from coke furnaces in a similar manner to the utilisation of the waste gas in blast furnaces, the coal industry, &c., by subjecting it to treatment and then using it for the direct production of power in gas motors. These endeavours are stimulated, without taking the economy of heat into account, by the rapid increase in the use of quick running electrical machines, which are dependent on rapid running motors. This utilisation of power will attain immeasurable importance directly it is possible to make the present day gas motors, which only act in one direction, reversible, similar to the piston steam engine.

The methodical investigations pursued by Germans, which were initiated and are stimulated by the efforts of other great civilised nations, has made amazing progress in this domain during a very brief space of time.

The German coal mining industry can also boast of standing foremost among the combatants against the inimical forces of nature. The gases issuing from the layers of coal, firedamp, &c., are—especially when conjoined with clouds of coal dust—the miners most deadly enemies. Exhaustive researches and continual practical experiments have been successfully made in the kingdoms of Prussia and Saxony for combating these dangers.

Public attention has been especially drawn to such accidents, because they generally entail very great loss of life; yet far less loss of life is thus caused than by the unexpected breaking away of rock. Nearly half the mining casualties in all countries are to be attributed to this latter cause. The Prussian mines administration has of late paid very great attention to this point in the hope of minimizing all accidents as far as possible.

Although these measures are being taken in the province of coal mining, the same precautions will also hold good in other branches of mining industry. This is especially the case with iron ore mining; this latter has developed extensively everywhere, as well as in the older works in Siegerland and Silesia. Thanks to the discoveries of Thomas and Gilchrist it has become possible to utilise the iron ores containing large amounts of phosphorus, which were formerly almost useless. But even the great increase in the production of these ores, especially in Hanover, Lorraine and the grand-duchy of Luxemburg (also belonging to the Customs' Union), does not suffice to completely supply the rising German iron industry with raw material; in order to supplement the supply, constantly increasing quantities of Spanish, Algerian, and lately Swedish ore have had to be obtained. The import of

these ores might be less if the transport of the inexhaustible natural supplies in Lorraine and Luxemburg could be effected at cheaper rates than at present. As regards potassium salts on the other hand Germany is quite independent of other countries, enjoying even a monopoly in them, no other land possessing such abundance of these salts. Mining, which is only a few decades old, and was originally limited to the province of Saxony, has meanwhile extended far into Central Germany. A syndicate has been formed there by the producers, in co-operation with the state mines, some time ago, and showed itself to be profitable, so that the example was followed more or less by the most important of the coal districts. The doubts originally expressed as to the right use of the great power acquired by the syndicate have been gradually silenced in face of the reasonable prices asked by the sellers' unions in the coal mining industry. During periods of the briskest demand these unions maintained the policy of moderate prices, thereby securing the fullest approbation of their customers; this policy is strikingly shown in a special report made at the instigation of the imperial government, referring to the activity and influence of the Sellers' Union in the mining industry.

The Rhenish-Westphalian Coal Syndicate, which after great trouble was the first to be formed in the year 1893 at Essen-Ruhr, in conjunction with the selling associations for other products of coal mining, has only just recently been reorganised and placed on a broader foundation for the next 12 years by extending its operations to the coal mines belonging to foundries and smelting works. The importance of this move for German economical history cannot be detailed here; suffice it to say that this union, which has been effected after untold trouble by far seeing men under the lead of Mr. Emil Kirdorff, the General director of the Gelsenkirchen Coal Mining Co. Ltd., will form the backbone of German industrial perseverance. Without this "rocher de bronze" German industries would not have so rapidly overcome the reverses of late years, the usual consequences of a too speedy development, and would now stand in the middle of the crisis, instead of being able to see a fair future before them.

These successes have awakened the desire in the sister industry to coal mining, the iron ore mining industry, to replace its loosely connected associations by a firm alliance and to create a German Steel Works Union, which would comprise the whole German mining industry, from crude iron to the finished product. As soon as the union has been formed it will be seen whether it will be advisable to create a comprehensive system of standardisation according to the American pattern, in which Vanderlip recently perceived one of the most important factors of American progress. In any case, however, the Steel Union will, if it follows the example set it by the Coal Syndicate, be instrumental in disposing of its products at suitable prices, thereby assuring employers the profits due to them, and to workmen living wages and constant work.

Hereby, the reform of German railway freight conditions is not only of decisive importance to the whole working population of Germany but also to every consumer. Following the example of Prussia, almost all the Federal States have acquired the railways of their territories and made the receipts of the same an integral part of their budgets. The adaptability which ought to be part and parcel of railways as a pre-eminent factor in civilisation is thereby considerably hampered. The freights of German railways possess, in spite of the raw product tariffs introduced during the last few years for wholesale transport, a rigidity which acts seriously on the market, and which is of doubtful policy as far as the budget is concerned.

In no other industrial country do the freights form such a high percentage of the expenses connected with disposing of products as in Germany. The fact that the Imperial Government has included the extension of the German canals in its programme for a long time past and its intention of speedily effecting the same may therefore be hailed with the greatest satisfaction.

The mining industry, as the most important freight provider, is most interested in the construction of better and cheaper means of traffic on account of the relatively small value of its products, and in view of the fact that every improvement in this direction means a saving for the benefit of the nation and may promote fresh productive investments.

The following figures supply information regarding the amount of freight handled by all the German railways:

1	2	3	4	5	6	7
Year	Total freight traffic on German railways	Of which the following amount was classed under				Share of columns 3–6 in column 2
		Bituminous coal and coke*)	Brown coal**)	Iron ore (exclusive of pyrites)	Salts	
	in 1,000 tons at 1,000 kgs					percentage
1885	111,200	46,273	7,915	4,461	889	53·5
1890	151,681	58,510	11,384	6,039	902	50·7
1895	181,480	67,235	14,604	7,167	1,062	49·6
1900	264,968	95,370	21,860	11,611	1,290	49·1
1901	259,380	92,245	22,229	9,857	1,306	48·4
1902	263,552	91,914	22,175	10,415	1,359	47·8

Just as traffic and mining have constantly acted and reacted on each other, so mining and the other branches of German industrial life have affected each other advantageously. For want of the most reliable data—the productive value of the individual groups—a comparison of the relations of the motor forces may not be out of place here.

*) From 1900, bituminous coal bricks.
**) From 1900, brown coal, bricks and coke.

The enormous strides made by German industrial efforts may be gauged with a certain amount of accuracy from the figures relating to the employment of auxiliary motor power. In 1875 no less than 886,000 h.p. was employed in all branches of German trade, without including that required for agriculture, railways, merchant and imperial navies. This amount however rose to 3,400,000 h.p. in 1895 for the whole of Germany. It may be noted here, that the horse-power of locomotives was estimated at 7 millions, whilst the German mercantile navy had 1,000,000 h.p. in the same year. Unfortunately more recent data as to the motor power in the German Empire are not obtainable. A fair guide regarding the rapid development which has made itself evident during the last few years may be obtained from the statistics for Prussia, which is the largest Federal State in size and industry. According to such statistics the amount of steam engine horse-power made use of in 1896, excluding locomotives, totalled 2,900,000. This amount rose to 4,900,000 in 1903. The horse-power of Prussian locomotives, calculated at a low figure, amounts at the present time to about 7,000,000 h.p., so that added to the above mentioned 4,900,000 a total in round figures of 12,000,000 h.p. for the whole of Prussia is reached. It must also be noted, that these figures only denote the horse-power produced by steam, so that the horse-power produced by water, and especially by explosive motors, is not taken into account.

If these data of the kingdom of Prussia are taken as a gauge for the development of the whole Empire, it may be assumed that the motor power used in the whole of the German Empire amounts at present to about 20,000,000 h.p. The basis of the production of this enormous amount is formed almost exclusive of mineral combustibles, steam acting in a preponderating manner as the agent for such production, as more than 4/5ths of all motors at work are driven by steam. In this domain the latest innovation, the steam turbine, has made rapid progress in its application, as, apart from the comparatively small amount of space it occupies, it is most suitable for working electrical machines. Nevertheless, the time is not far distant, when the advantages described above of the direct utilisation of power by the means of gases will turn the scales in their favour as compared to steam.

The details already quoted regarding the development of motor power call to mind the following words of the well known German statistician Dr. Ernst Engel in his work "The Age of Steam:"

"Despite the enormous advantages of steam as regards its use and cost over all other known motor forces, despite its use in lessening distances and in saving time, it remains an unsolved mystery that solely on that account such boundless capital should have been placed at the disposal of the steam enterprises not only of our own state but also of those of the whole world, thus enabling them to spread with ever increasing speed throughout all cultivated states. This was at the same time materially assisted by the great inventions to which steam also contributed to a certain extent, and by the progress made in physical science, mechanics and technology, since by them nature's treasures

were rendered accessible to all who possessed the knowledge, power, courage, and endurance to make her treasures their own. When nature distributes her gifts, and she does so with no niggard hand, it is incumbent on us not to let them lie fallow; certain tools must be made use of in order, for instance, to utilize steam in boilers, motors, and various other machines, and to turn chemical forces to account. The more means one uses to take advantage of the resources of nature, the greater is the number of people who can participate in the blessings thereof, the more strive to do so, and the more, unconsciously benefit thereby.

Thus only can the enormous amount of capital contributed to steam enterprises be explained, which in their turn exercise a beneficial influence on every side, for the greatest part of the means herein employed are converted into workmens' wages."

Yet in spite of this great prosperity, the German mining industry ranks only third in comparison with other important mining states. Great Britain, the United States of America and Germany, alone provide 80 per cent, of the total coal in the world, France and Belgium supplying about 9 per cent, so that the following figures represent about nine tenths of the total coal produce, and similarly of the pig-iron.

1	2	3	4	5	6	7	8
	1893	1897	1899	1900	1901	1902	1903
	in 1,000 tons at 1,000 kgs						
A. Coal:							
United States of America	165,420	181,630	230,178	244,641	266,064	272,412	323,684*)
Great Britain and Ireland	166,955	205,353	223,607	228,773	222,542	230,718	(det. lack.)
Germany	95,426	120,475	135,845	149,788	153,019	150,600	162,620*)
France	25,651	30,798	32,863	33,404	32,325	29,997	35,000*)
Belgium	19,441	21,492	22,072	23,463	22,213	22,877	(details lacking)
B. Pig-iron:							
United States of America	7,238	9,807	13,839	14,010	16,133	18,106	18,297*)
Great Britain and Ireland	7,089	8,937	9,572	9,103	8,056	8,818	8,350*)
Germany (with Luxemburg)	4,986	6,881	8,143	8,521	7,880	8,530	10,086*)
France	2,003	2,484	2,578	2,714	2,389	2,405	(det. lack.)
Belgium	745	1,035	1,025	1,019	764	1,069	1,217*)

In 1903 the pig-iron production of Germany (including Luxemburg) rose again to a surprising extent, and it rose for the first time to 10,000,000 tons.

Since 1897 Great Britain has had to yield her leading position in pig-iron to the United States, principally owing to the home supply of iron ore

*) Preliminary result.

not sufficing for the demand and its having to be supplemented by foreign ores. The first place in the production of coal, which Great Britain has held uncontested for decades, passed over to the United States in 1899 as a result of the rapid increase in American production. In contrast to Great Britain, whose mining industry has reached a culminating point, that of the United States, although not always free from relapses, has taken a turn of prosperity. This doubtless has been aided not only by natural conditions, but also by the extremely cheap freight rates of the American railways, as well as by the increasing use of machinery in mining, especially the in actual work of extraction.

The Exposition at St. Louis will give German visitors a new and welcome opportunity to study the causes of the flourishing condition of American industry, and to interchange ideas and experiences with their American colleagues. This reciprocal action will fulfil one of the most noble aims of technology, the fostering of the development and progress of mankind.

Engel.

PROTECTION OF THE WORKING CLASSES.

The protection and insurance of labour are two directions in which the German Empire has employed practical measures for improving the condition of the working classes.

Laws for the protection of the working classes relate to those in good health, and aid in forming, carrying out and dissolving contracts, in maintaining life and health, and, by means of preventive measures, in offering such security as is required to form a foundation for gaining a livelihood. Laws for the insurance of the working classes aim at restoring to their former capable condition those who are injured while performing work, or at least at affording them compensation for loss.

Although the insurance of the working classes was initiated by the message of His Majesty, Emperor William I. on November 17th, 1881, the laws pertaining to the protection of the working classes are due to the decree issued by Emperor William II. on February 4th 1890. This contains the following words: "Although the results of laws and measures for the improvement of the con-"dition of the working classes have been successful and valuable, they do not "suffice for the task which I aspire to perform."

"In addition to an extension of the laws pertaining to the insurance of "the working classes, the existing regulations regarding the condition of em-"ployees in factories must be investigated in order to remedy complaints "which have been made in this direction, and to accede to just demands. "This investigation must be based on the fact that it is one of the tasks of "the executive power to regulate the period, duration and kind of work per-"formed, in order to maintain health and morals, satisfy economical wants "and claims to equality in law. Propositions as to the form of certain regu-"lations for preserving good relations between employers and employees must "be made, wherein the working classes are enabled, through representatives in "whom they place confidence, to participate in the regulation of all matters

"of common interest and in the promotion of their interests in all negotia-
"tions with employers and with the organs of our realm. Such regulations
"would give the working classes the privilege of expressing their wishes and
"of entering complaints without let or hindrance; they would also enable
"municipal authorities to be constantly informed concerning the condition of
"the working classes, and to remain in touch with them"

Although several laws relating to the protection of workmen were passed during the period 1880–1890, before this decree was issued, nevertheless the law for the protection of workmen, now in force, dates from 1890.

The proposals made in the Emperor's programme were rapidly executed. Several supplementary laws relating to trade regulations were passed in quick succession, the most important being that of June 1st 1891, and a law pertaining to industrial courts (July 29th 1890, and September 29th 1901) and another for the protection of children (March 30th 1903).

The system of protection of the working classes, now in operation, has four aspects: 1. Protection in relation to places of occupation, 2. Protection in relation to occupation itself, 3. Protection in matters relating to contracts and wages, and 4. Protection in relation to education.

The regulations which come under consideration are principally enforced by industrial supervisors. The Department in the Imperial Statistical Bureau for Statistics of the Working Classes, and the Government Museum for Public Welfare are engaged in extending and improving the laws for the protection of working classes.

The regulations passed are of a legal public nature, similar to those for the insurance of the working classes, and cannot be changed by any private agreement between employer and employee; non-compliance is punishable.

The German laws for the protection of the working classes are confined in their operations principally to the employees in factories, and more recently to those occupied in shops (public places of sale) as well as to children engaged in domestic industry and other professional work undertaken by the family. The privilege exists, furthermore, of extending the protection to handwork and domestic industries, and this has been taken advantage of by manufacturers of clothing and underwear.

The following details concerning the laws for the protection of the working classes may be given:

1. Protection in relation to places of occupation. The aim of this clause is to protect employees from danger to life, health and morals, while performing their work.

For this purpose employers are obliged to furnish and maintain workrooms, mechanical contrivances, machines and instruments in a condition adapted to protect employees from all possible dangers, and to regulate the work in a similar manner. Care must be given to provide sufficient light, space and ventilation, and to remove all dust, odours and gas, caused by the work, and all refuse. Contrivances must also be provided for the prevention of contact with machines, and precautionary measures taken against other

dangers associated with such occupations. In addition to suitable mechanical contrivances, special safety regulations have been issued relating to the performance of work and to the conduct of employees.

Furthermore, employees must fulfil all requirements for the maintenance of morality and propriety (separation of the sexes during work as far as possible, separate dressing rooms, wash rooms, and proper closets). For certain establishments the police authorities are empowered to enforce the above principles (for instance, properly heated dining rooms during the cold season, separated from the work-rooms, &c.). The Federal Council has the right to regulate these measures in a general way for certain kinds of establishments. It can fix the time of beginning, the duration and the time to end the work to be done daily, the rests required, and all rules necessary for practical application in establishments where the health of employees is endangered by excessive hours of work. The council has issued such special regulations for enforcement in bakeries, coffee-houses, grain mills, hotels and saloons where waiters and apprentices are occupied, as also in match and rubber factories, printing establishments, type foundries, stone quarries and works. At the same time regulations of a special character are made for the protection of female employees and young persons from the dangers associated with lead paint, sugar of lead, cigar and alkali-chromatine factories, accumulator establishments, horsehair loom works and brush factories, Thomas slag mills and store-rooms, zinc and glass works.

Finally, the Federal Council has the right to issue regulations protecting the interests of employees in open shops. One regulation issued requires the provision of seats for employees in all places for the public sale of merchandise.

For subduing phosphoric necrosis the employment of white and yellow phosphorus in the manufacture of combustible materials has been forbidden by an imperial law passed on May 10th 1903.

We may also mention here the numerious regulations for the prevention of accidents which the trade associations have imposed on the establishments belonging to them, in order to enforce the accident insurance laws; these regulations assist in maintaining safety, health and morality among employees. For the enforcement of these regulations, special officials have been appointed by the trade associations.

II. Protection in relation to occupation. This clause treats of restrictions in the employment of the working classes on the one hand, and in complete prohibition on the other. The so-called restrictions secure to employees certain suspension of work, free Sundays, night rest, and breaks during the daily work; they regulate a minimum suspension of work as well as a maximum duration of daily work.

These regulations for the suspension and duration of work are expressed in a special clause pertaining to Sunday closing. Employers cannot compel employees to work on Sundays and holidays. Any obligation of this kind in a contract is illegal.

In addition to the civil illegality of the aforesaid contracts, there is a public law prohibiting the employment of labour on Sundays and holidays under penalty of severe fines. This law applies in a slight degree to mercantile trades. Occupation on Sunday is entirely prohibited in mines, salt works, ore refining works, quarries, foundries, factories, workshops, lumber yards and other building establishments, shipyards, brickyards and on buildings. Hotels, saloons, musical performances, shows, theatrical performances or other amusements and entertainments as well as those occupations relating to traffic are not subject to this law. The Federal Council can, however, extend the prohibition to other trades. The rest to be granted to employees for work done on Sundays and holidays must amount to 24 hours; for two days, a Sunday and holiday following each other consecutively, 36 hours; for Christmas, Easter and Whitsuntide, 48 hours each. In mercantile industries, work on Sundays and holidays, on Christmas, Easter and Whitsuntide Bank holidays is entirely prohibited, whilst 5 hours work at the most is permitted on all remaining holidays, unless the statutes of the community or of municipal unions extend the restrictions, or entirely prohibit work in all or several mercantile trades. During the 4 weeks preceding Christmas and on certain Sundays and holidays when local conditions require an extension of business, the police authorities can make an exception and permit work to be done for a period not exceeding 10 hours.

For technical, economical or other reasons (e. g. repairs in order to avoid interruption in daily operations, stock taking, public requirements in the provision trade, cases of emergency, &c.) exceptions are made to the Sunday law. In these exceptional cases, however, employees receive a corresponding compensation for their loss of leisure; if the Sunday work lasts longer than three hours, or employees are prevented from attending church, they are entitled to 36 full hours at the end of every third week, or have free time on every second Sunday at least from six o'clock a. m. until six o'clock p. m.

Although the aforesaid law prohibiting Sunday work relates to the staff in industries of production and not to the proprietor and his family, the restrictions in mercantile trades must be respected even by the owners themselves.

Young persons, (under sixteen years of age) with very few exception, are not allowed to work on Sundays and holidays in factories or similar establishments.

The German legal administration has hitherto refrained from fixing a standard for the duration of working-days. For male adults a maximum working-day has been established. In trades where immoderately long working-days endanger the health of the employees, the Federal Council of Trades can pass resolutions fixing the duration, beginning and end of a working-day, and the amount of rest deemed needful; the necessary regulations for carrying these into effect can also be issued. Such regulations have been made relating to bakeries, coffee houses, grain mills, electric accumulators, factories, hotels and saloons. These secure to employees, among other pri-

vileges, an uninterrupted minimum leisure of 8 hours. For employees in shops, or in offices and store-rooms connected therewith, the law provides an uninterrupted minimum suspension of 10 hours. Information concerning other trades, for which the hygienic maximum working-day should be recommended, is obtained from special industrial statistics collected by the Statistical Department of the Working Classes in the Royal Statistical Bureau.

The regulations issued in the interests of adult male employees benefit female and young employees by shortening the working-days still further than the maximum working-day which the present law prescribes for female and young employees.

Adult female employees (adults, i. e., those over sixteen years of age) are not permitted, according to the general legal regulations, to work more than eleven hours daily, and at the most ten hours on the days preceding Sundays and holidays. A break of one hour is granted at noon, or if they have families, they can generally claim for 1½ hours at noon. On Saturday and the days preceding holidays, work must cease at 5·30 p. m. Occupation during the night (from 8·30 p. m. to 5·30 a. m.) is forbidden. The occupation of women who have given birth to children is prohibited for four weeks after confinement, and for the next two weeks only with the consent of a licensed physician. The same laws are in force in work-shops for clothing and underwear. It is prohibited to employ women in underground establishments, in mines, salt works, ore refining establishments, quarries and pits. The Federal Council can pass laws prohibiting the employment of women and young persons in factories where health and morals are especially endangered, or their employment is only allowed under fixed conditions. The Federal Council has taken advantage of this right in numerous cases, e. g. in relation to the employment in rubber factories, in glass works, wire works driven by water power, factories of chicory, raw sugar, cylinder and hammer works, hatchel rooms, factories of lead paints and cigars, brickyards, horse hair loom works, brush factories, zinc works, &c.

"*Youthful employees*" are divided into two classes: "children under 14" and "young persons" under 16 years of age.

For the protection of children, the trade regulations (§ 135) and the law dated March 30th 1903 relating to the work of children in industrial establishments are valid.

These laws prohibit the employment of children under 13 years of age in factories, and also of children over 13 years of age unless exempt from attending the elementary schools. The employment of children under 14 years of age moreover must not exceed 6 hours daily. The maximum duration of employment in factories for young persons between 14 and 16 years of age, is 10 hours. The employment of all young persons for night work (from 8·30 p. m. to 5·30 a. m.) is prohibited; and further, a break of an hour at noon, half an hour during the forenoon, and another half hour during the afternoon are required. These laws are also in force in clothing and underwear factories. The employment of young persons in other manufactories where

health and morals are endangered can be prohibited by regulations issued by the Federal Council, as is the case with female employees engaged in rubber factories, glass works, &c.

The employment of children under 14 years of age as pedlars is prohibited with certain exceptions; furthermore, the employment of one's own or other people's children on buildings, in brickyards, quarries worked by day, pits and numerous other establishments, specially enumerated, where children are exposed to dust, as also in stone works, for chimney-sweeping, public driving, mixing and grinding paints, in cellars, in public theatrical performances and other public shows, is not permissible. The employment of children under 12 years in work-shops of all sorts, including living and sleeping rooms and kitchens used for trade purposes, working places in the open air and in all commercial trades, is prohibited. Children over 12 years of age are not permitted to work by night (from 8 p. m. to 8 a. m.), nor during school time in the morning, and altogether only under certain conditions. The employment of children in hotels and saloons, in the delivery of goods or on errands, is subject to similar regulations.

According to the laws in force it is not only difficult to employ children and young persons, but also all minors; in every case the employer must give notice to the local police authorities before employment, and furnish an employment card or book for every person. In factories a list of young and female employees must be furnished, stating the duration and kind of employment, and a copy of the rules and regulations in relation to young and female employees must be hung up publicly.

III Protection relating to Contracts and Wages. The laws of trade at present in force give young persons a certain guarantee in regard to their employers; for instance all persons who have lost the right of citizenship are prohibited from employing young employees under 18 years of age, or from taking apprentices. In order more clearly to define the terms of employment for certain industries, the Federal Council can prescribe wage and work tickets, —for the clothing industry such have already been issued—stating the kind and amount of work, if job work the number of pieces, the wages, the terms for furnishing tools and materials for the work undertaken, and terms for board and lodging. In factories where 20 or more persons are employed, the proprietor in association with all employees must issue rules and regulations fixing the duration of work, the amounts of wages, terms of notice for quitting, and fines. As security for fulfillment of contract, the employer has the right to retain a fixed amount of wages, or a right of requisition to the amount of wages customary in the locality; the latter can also be claimed by the employees. The wages of employees are still further secured by regulations tending to discourage drinking, by the prohibition of paying wages in public houses and saloons, by the enforcement of local statutory regulations fixing times of payment, &c. For minors, books containing entries of wage payments are required. Each payment is entered by the employer and the book given to the minor or his legal proxy to be presented again at the next payment. Local

statutes can also prescribe that the wages of minors be paid to parents or guardians, and only by the consent of the latter to the minors direct. In dissolving contracts both employer and employee have to abide by the mutually agreed term of notice, or in lack of any agreement a 14 days' notice is prescribed by law. On leaving his occupation, the employee can demand a certificate stating the kind and duration of work, his capabilities and conduct, &c.

IV. Protection in relation to Education. The law prescribes numerous duties on the part of employers and masters of trades towards employees concerning the improvement of their education. Employers are required, for instance, to grant employees under 18 years of age sufficient time to attend a public or industrial school for progressive education (including schools for hand and house work), whether the attendance is voluntary, or in compulsory compliance with local statutes relating to male employees under 18 years of age, to female employees in shops, and apprentices under 18 years of age. A master must not only grant his apprentices time for attending a school for progressive education in a special branch, but must insist on their attendance, watch their movements, and instruct them in all kinds of work executed in his establishment which are necessary for their education. It is also not permitted to occupy young persons during the time fixed by the appointed clergyman for confirmation instruction, sacrament, &c.

V. In order to obtain a quick and inexpensive settlement by experts of all disputes arising between employers and employees, special Industrial Courts have been established, according to the Imperial Law of July 29th 1890, framed on June 30th 1901, and these are to be found in all cities containing over 20,000 inhabitants. The dispute as a rule is placed in the hands of three members for settlement, an official chairman, a representative for the employer, and one for the employee: all industrial disputes between employer and employee and between employees of the same employer, regarding the performance of work, questions of the engagements, duration of contract and dismissal of employees are points generally under consideration; the return of the employment book, the contents of the same, certificates of conduct, wages books, employment tickets, payment books, capabilities for certain positions, return of certificates of conduct, tools, clothes, &c. furnished for certain work, claims made by one employee against another regarding work undertaken in common from the same employer are also points settled.

In addition to passing judgement, the industrial court is also empowered to arrange disputes. It can interpose in disputes between employers and employees, and aid in settling terms for continuing or renewing work, endeavoring with moral suasion to end the dispute by mutual agreement or by passing judgement.

The further perogatives of the Industrial Court are to act as an expert in industrial affairs. It must grant information in answer to all inquiries from the government or community, and can also require information to be furnished in special cases by the government and communal authorities.

VI. The execution of the regulations for the protection of the working-classes is in the hands of industrial officials—male and female—appointed

especially for this purpose. Inspection is aided by the police authorities and (particularly in the protection of employees on buildings) by all organs of the working classes, and the officials have the same rights as the local police, particularly in the inspection of all factories and works. They generally possess a technical education, and in addition to university study they have obtained expert knowledge in industrial inspection. Their duties are determined by the governments of the Federal States. They are required to produce annual reports of their official operations and these are either partially or entirely published. The industrial inspectors are not only engaged in supervising the execution of the laws for the protection of the working-classes, but in account of their thorough knowledge of the conditions existing among those classes they are expected to make suitable proposals for the improvement of the laws for the protection of labour.

VII. In order to investigate the circumstances of the working-classes, especially for collecting and periodically publishing material for statistics in relation to these classes, a special department for statistics of the working-classes has been established since April 1st 1902 at the Imperial Statistical Bureau, and this has been assisted by an auxiliary council for labour statistics composed of members of the Federal Council and the Imperial Parliament. These works, prompted by the aforesaid department, are partly published in the "Imperial Employment Journal" issued monthly since April 21st 1903 (Price 10 Pfgs. per number or 1 M. annually) and partly as special printed matter. The information concerning the general condition of the working-classes and the existing state of certain branches of industry published in this manner, and especially the aid which the auxiliary council gives in presenting the results to the Imperial Chancellor, furnish further evidence of the progress made in the protection of the working-classes.

VIII. The interests of the working-classes are further promoted by the Imperial Museum for the welfare of the working-classes, established at Berlin-Charlottenburg since the spring of 1903. Its aim is to exhibit models, safety appliances directly attached to machines, plans, &c., in order to give those interested, (employees, employers, trade associations, manufacturers, engineers and government authorities) an opportunity of obtaining information about the most important inventions the progress made in protection against accidents and in industrial and social hygiene. These exhibitions are permanent, and consist of all the new appliances which are worthy of imitation, and prove thus an effective incitement to progress and a valuable factor in all social undertakings. A similar museum of appliances for the welfare of the working-classes, but less extensive, is situated at Munich.

IX. The results of the regulations for the protection of the working-classes are in general very satisfactory. Owing to the laws for protection in relation to places of occupation, enough has been done to insure health, safety and morality in numerous branches of industry to all employed. Rapid progress has been chiefly made where special regulations have been issued. Improvement of conditions is more easily effected in newly built esta-

blishments, and this is due to the fact that the proprietors themselves are interested in the welfare of their employers. Working materials, tools, workrooms and methods of work are being chosen and arranged more and more in such a manner that all injury and danger to the workmen is avoided as far as possible.

The protection in relation to occupation has resulted in rendering Sunday and night work only necessary when technical and economical reasons urgently demand it, at which times wages are increased. The regulations concerning a maximum hygienic working-day for males, and a general maximum working-day for young persons and females, have also caused an increase in the inclination to shorten the duration of work, especially in large cities. In spite of the restrictions put upon the employment of young persons and females, there is no apparent decrease in it, which is a proof that industrial branches are able to continue work according to the regulations in force. The employment of children in factories has almost entirely ceased. Experience has proved that the regulations adopted in large establishments for protection in relation to contracts have had excellent results, and have aided in settling terms and improving the conditions of work. The employment tickets placed free of charge at the disposition of employers in certain cities, have proved very useful in this respect. On the other hand, committees of employees have not been made extensive use of, only a number of establishments engaged in extensive operations and certain government works possessing such institutions. Many employers entirely omit any notice to quit, in order to be able to dissolve contracts immediately, if desired. Only isolated cases have occured where the regulations against drinking and against payment of wages in saloons have been violated. Another day in the week is frequently chosen as pay day instead of Saturday. Several communities have already adopted statutes regulating the time of payment of wages. Payment books for minors have not proved to be advantageous. The payment of the wages of minors to their parents has only occured in a few cases.

There are 354 Industrial Courts in Germany; in 1900 there were 316. Their powers are taxed to the utmost, which shows how serviceable this institution has been. They were occupied with 85,915 industrial disputes in 1902, of which 80,454 were caused by employees, and 5,461 by employers. 57 per cent of these were settled by mutual agreement. In 4,728 cases the proceedings lasted 1 week, in 5,033 cases less than 2 weeks before the announcement of the verdict. In addition to a quick and inexpensive arrangement of disputes at the hands of experts, the Industrial Courts have assisted in increasing the knowledge of the law, especially of that relating to industrial contracts among the industrial classes; this occurs, on the one hand through the instruction given to the disputants by the presiding judge, and on the other hand through the instruction given by the assistants to their electors by reproducing in the form of lectures their experiences gained in the Industrial Court. Increase in legal knowledge will cause a decrease in the number of cases. The Industrial Courts have not as yet been active in settling strikes

and cases of discharging employees, but they have nevertheless frequently been successful in bringing about a peaceful result in strikes of extensive proportions. Their importance as agents in industrial activity and in promoting an undisturbed pursuit of trade, as well as a steady development of our economical relations, is continually increasing.

The introduction of industrial inspectors has proved extremely advantageous; there are at present 213 in Germany, to which must be added 141 male and 19 female assistants, as well as 6 chemical experts. It is due to them alone that the regulations for the protection of the working classes are not simply a dead letter, but are executed in a conscientious and proper manner. Their unprejudiced, propitiating and yet judicious attitude towards employer and employee has won for them the confidence of both parties, so that they are often able to dispel the first shadows of a quarrel between master and man. They are thus able to obtain an insight into the circumstances affecting the working classes, and to make useful propositions for the improvement of the laws for their protection.

Social peace in industrial circles will be still further promoted by the Boards of Employment already mentioned in the Emperor's decree issued Feb. 4th 1890, but not yet put into force (according to the statment of the State Secretary for the interior, expected to come into force January 30th 1904); the use of collective employment contracts will be renewed similar to those used between organisations of employers and organisations of employees, regulating terms of employment (wages, duration of work and the keeping of apprentices) in a large number of branches for a long period of time. The favorable experiences in this direction incite continually to imitation.

It is finally deserving of mention how willing employers, employees and their unions are in assisting the Department of Statistics of the Working Classes to perform their duties. The unions at the official central office for statistics of the working classes are particularly active in giving information concerning the working classes, in reporting bad conditions, &c., and thereby aid in improving the circumstances of all who are endeavoring to gain a livelihood.

Friedrich Zahn.

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Friedrich Zahn.

WORKMEN'S INSURANCE.

The purpose of the exhibition representing the German Workmen's Insurance system, is to give a complete picture of the methods and activity of social insurance.

The workman's insurance stands in correlation to legislation concerning his protection, both supplementing each other in the social political provisions for workmen which are intended to assure the masses of wage-workers of modern civilised industrial states against the dangers of their calling. On the one hand, protective legislation aims at preserving working ability through protection of life and health; on the other, in those cases where either through sickness, accident, or other invalidity working ability is temporarily or permanently lost, workmen's insurance seeks, by means of corresponding indemnity—unlike mere almsgiving—to afford assistance to the workman and those dependent on him. Provisions for workmen effecting these aims have been provided by imperial legislation, stimulated by the imperial messages of November 17th 1881, and February 4th 1890—Germany acting as a pioneer in this domain.

The peaceful work of conciliation and social reform began with the memorable message of His Majesty Emperor William I., dated November 17th, 1881. This message expressed the conviction that in the inevitable exigencies of modern life the needy circles of the population had a claim to a high measure of protection, and that it should be the object of an administration based on true Christian principles to meet such claims by combining the actual capabilities of the people into associations. A thorough adjustment of the insurance systems relating to sickness, accidents, invalidity and old

age was accordingly considered to be a most pressing need. Experience having proved that neither the workman nor the aid granted by the state sufficed to solve this problem, new methods were adopted, and by means of compulsory insurance laws the classes of the population concerned united together into corporate bodies possessing self-administration.

The trade or district (township) associations consequently became the natural bearers of the insurance risk. The foundation-stone of the whole system is mutuality and self-administration. Compulsory insurance is limited in general to those who are dependent from an economical point of view, that is to say wage-workers and subordinate officials with a salary not exceeding 2,000 marks. However, higher officials and persons carrying on small businesses are allowed to participate in this compulsory insurance, or to insure voluntarily according to need. Every insured person has a lawful claim, with the right to legally defined assistance, free of cost.

Insurance against sickness is regulated in the case of commerce and trade by a law dated June 15th 1883 and a supplementary law and amendment in same dated April 10th 1892, and May 25th 1903 respectively, whereas the regulation of insurance relating to agriculture and forestry was left to the statutes of the various districts or states concerned.

The minimum of relief in case of sickness entitles the beneficiary to free medical treatment and medicine for 26 weeks, and in case of incapacity for work, financial assistance to the extent of one-half of the average daily wage, or to free hospital-nursing, besides one half of the allowance for these dependent on the sick person. Further it entitles sick women to relief for six weeks after their confinement, and in case of death burial money amounting to twenty times their average daily wage. The necessary means are raised by weekly contributions (not higher than 4 per cent of the average wage) two-thirds of which is borne by the insured, and one-third by the employer. The administration is carried out through sick clubs organized according to trades or localities, whose presiding officers are chosen from the insured and the employers according to the ratio of the contributions. The insurance against sickness embraces (inclusive of the miners' clubs) about ten million persons in more than twenty thousand clubs, and involves an annual expenditure of about 200 million marks.

Insurance against accidents replaces the old law of Employers' Liability (its many deficiencies being equally harmful to employer and employed) by a legal (social) provision, which also insures the person injured, or his survivors in cases of casual accidents, or such as have occurred through the fault of his co-workers, or through his own carelessness.

The personal liability of the employer is changed into an economical charge upon the entire trade concerned, which is apportioned to single establishments according to the measure of their risk (workmen employed, and danger).

For lack of precedent, the regulation of accident insurance could proceed but slowly, the original law of July 6th 1884, which was limited chiefly to industrial (manufacturing) establishments, being the first issued.

Based upon this fundamental law, accident insurance was extended to traffic and transport establishments, agriculture, forestry, the building industry, and navigation by Imperial laws dated May 28th 1885, May 5th 1886, July 11th and 13th 1887, whilst the inclusion of trade, handicraft, small factories (about 1 million establishments with 2 million workmen) remained to be effected. After the revision of this law (Oct. 1st 1900) it was replaced by a fundamental law of June 30th 1900 and improved by laws relating to trade, forestry, navigation, and the building industry.

The insurance is carried out under guarantee of the Empire on the reciprocal system by employers who unite together into trade associations, which are formed according to different branches of industry; the self-administration of the associations can be decentralized by the formation of "sections" and appointment of "confidential agents."

The minimum indemnity against accidents comprises: 1. in the case of wounded persons (from the commencement of the fourteenth week after the accident, that is to say as a supplement to the sick insurance) the expenses of medical treatment, and a payment during the period of incapacity for work up to 66 2/3 per cent of the annual earnings, or free nursing in an institute until medical treatment is no longer necessary, and the same allowance to those dependent on the injured person as in case of death; 2. in case of death funeral money to the amount of the fifteenth part of annual salary, but in any case not less than fifty marks, and for those dependent on the deceased an allowance amounting to 60 per cent of the annual wage for widow and children, and to 20 per cent of same for necessitous parents.

Indemnification amounts are determined by the organs of the trades association, against whose decision appeal can be lodged (within a month) with the court of arbitration, in which employer and employed are represented equally, and final recourse may be had to the Imperial Insurance Department. The indemnifications are advanced by the post-offices upon notification of the board of directors, and at the end of each fiscal year are prorated among the association membership according to the wages-sheets and risks attending the occupation. In order to diminish the chance of accidents and "accident charges" the trade associations, after consulating the workmen representatives, have the right to issue special regulations for the prevention of accidents, the efficacious carrying out of which is incumbent on them.

The accident insurance system embraces in 66 industrial and 48 agricultural unions, more than 5 million establishments with almost 19 million insured, among which about 4·8 million farmers with less than 10 hs of land, and 1·5 million persons occupied in subsidiary industries, or in more than one trade, are insured. Up to the end of 1903 more than 1,000,000,000 marks have been paid in indemnities for accidents to those insured.

Insurance against invalidity and old age, which was introduced on the first of January 1891 by an Imperial law dated the 22nd of June 1889, and revised by the invalidity insurance law of 13th of July 1899, which took

effect on the 1st of January 1900, completes the system of workmen's insurance. The bearers of the insurance, which includes all branches of trade, are territorial insurance institutions, guaranteed by the state, whose self-administration is shared equally by the employer and employees. The insurance entitles those incapable of work to pensions without regard to age, and gives old age pensions to septuagenarians regardless of working ability. Further it assures return of subscriptions paid by insured women who marry before receiving a pension, to widows or orphans of those insured persons who die before receiving an allowance, and to those insured who become invalid through accidents, but who do not receive an invalid allowance because of their higher accident insurance allowance.

The means necessary for this insurance are raised through a yearly contribution from the government of 50 marks for each pension, together with weekly contributions to an equal amount from employer and employed. The amount of the same for a definite period is so estimated in advance, that the capital value of the pension amount which the insurance institution must bear is covered, as well as the reimbursements of contributions, and the other expenses of insurance.

For the purpose of estimating the contributions and pensions, five wage-classes are formed, with yearly incomes of not more than 350, 550, 850, 1,150 and exceeding 1,150 marks, and the contributions are fixed at 14, 20, 24, 30 and 36 pfennig respectively.

Certain transitional regulations in favor of those insured who have already become incapacitated for work before they are entitled to compensation (a period of 200 or 1,200 weeks, during which they contribute to the accident or old age insurance fund), or to those who reach their seventieth year of age, guarantee the immediate payment of the invalidity or old age pension by shortening the time of waiting concerned.

The invalidity insurance scheme comprises about 13·5 million persons insured, or almost the whole of the hired working classes, and during the first twelve years of its existence (1891–1902) in addition to 1,093,681 subscriptions returned, and 156,000 cases of maintenance, has paid 720,000,000 marks (including state assistance to the amount of 252,000,000) for 1,302,900 allowances (402,856 old age and 900,044 invalidity cases) and has received 1,359,000,000 in contributions.

According to this, it is principally due to the Imperial social policy, that almost the whole body of working men in Germany is insured against sickness, accident, and invalidity, and that a million marks is devoted daily to the welfare of labour, whereas in other countries without compulsory insurance only a fraction of the workmen enjoy similar privileges; consequently such countries are considerably behind Germany in the reliability and scope of the efforts made for the insurance of workmen.

Certain transitional regulations in favor of such insured persons who during the first five years after the enactment of the law became incapable of work, or at the time of its enactment had passed the age of forty,

guarantee the immediate payment of the invalidity or old age pension by shortening the waiting time concerned.

To the initiative of Imperial social policy the blessing is therefore due that in Germany nearly all workmen are insured in case of sickness, accident and invalidity. Every day 1,250,000 marks are spent for this branch of workman's protection alone. In countries without compulsory insurance, scarcely one tenth of the workmen enjoy a similar protection, which moreover falls considerably short of the German workmen's insurance in certainty and scope.

According to the latest statistics (for 1901), the following number of working persons have enjoyed the benefits of:

1. Sick Insurance: 3,617,022 sick persons (with 66,652,488 sick days), with 163,400,000 marks indemnities (sickness, death money, as well as cost of medical attendance);

2. Accident Insurance: 585,596 wounded, 12,128 married women, 26,612 children, 256 parents (as dependent upon the wounded being cared for in hospitals); 53,481 widows, 87,035 children, 3,147 parents (of deceased); total 768,255 persons, with 100,000,000 marks indemnity;

3. Invalid Insurance: 549,000 invalid pensions amounting to 66,300,000 marks, 203,000 old age pensions amounting to 24,700,000 marks, total number of pensions 752,000 amounting to 91,000,000 marks, 191,000 persons with 6,900,000 marks refunded, 33,000 persons in medical treatment with 7,100,000 marks, total 976,000 persons with 105,000,000 marks indemnity.

From the above table it will be seen that in one year over five million persons in need of help received about 370,000,000 marks; during the whole period of 17 years (1885—1901) 50,000,000 persons in round numbers (sick, persons injured, incapacitated and their families) received indemnities amounting to 3,000,000,000 marks as a result of the legislation for the insurance of workmen, although the most far-reaching clauses of the law (insurance against invalidity) only came into force on Jan. 1st 1891. The workmen have only paid the smaller part of the contribution, and have already received about 1,000,000,000 marks more in compensation than their contributions amount to. If the amount of the two last years (1902 and 1903) be added to that of the miners' sick-clubs (whose total share represents about one-tenth of the other sick-clubs) the total sum of money paid to workmen for compensation is 4,000,000,000 marks.

The significance of this insurance for German workmen extends far beyond a simple financial one, for it has become a social-political school for the whole nation.

The importance of German workmen's insurance towers far above its financial aspect. Through the mutual participation of the employer and employee in the administration and payment of contributions, the workman is himself daily reminded of the moral duty of making provision for the future from his own resources, the employers of their social duties to their employees, and

both parties of their common interest in their calling. Thereby social reconciliation is effected where otherwise special organisations array themselves against each other as antagonists. The workmen's insurance with its self-administrative bodies, its concentrated means and powers, has brought goals hitherto considered unattainable within easy reach. Thus the free initiative of accident co-operative associations, invalidity institutions and sick clubs has been directed towards restoring lost or menaced working ability, and it has also rendered the cure of invalid and disabled workmen much more rapid through the erection of special institutions. (See exhibits in German workmen's insurance section.) The successes attained in this domain have been instrumental in directing the entire efforts made for the welfare of public regimen into new channels. Of greater importance, however, is that the cure of invalid and disabled workmen is more rapidly effected through the erection of special institutions. (See exhibits of the Imperial Insurance Department.) Because of the success reached through these measures, public sanitation has been directed into entirely new channels. Above everything else, the co-operation of these organisations with those of free charity, especially with the "Red Cross Society" and the "National Women's Club," has made it possible for even the smallest and poorest country parish to systematically cure the sick, and to undertake an organised campaign against that frightful national pestilence, tuberculosis of the lungs. (See statistical and graphic exhibits in the Exposition.) Instead of smothering the free initiative of self-helping bodies, as many had feared workmen's insurance would do, it has on the contrary enabled them to develop to their highest powers.

The reserve capital of 1,500,000,000 marks, about which such different opinions exist, has furnished the means for solving the most important social economical questions. Up to the end of 1902 over 400,000,000 marks had been expended from the funds of invalidity insurance institutions for the construction of workmen's dwellings, sick and convalescent houses, sanatoriums, public hospitals, homes for travelling workmen, public baths, blind asylums, kindergartens, slaughter houses, systems of water works, sewerage and draining plants, street paving, savings banks, co-operative stores, and similar institutions for public welfare, as well as for the payment of agricultural loans (mortgages, light railroads, land and road improvement, development of cattle breeding, &c.) all measures the final aim of which is to cause the masses of the people to participate to an ever increasing degree in the advance of civilisation.

The advantages of German workmen's insurance, in distinction to other systems, is, that:

1. It guarantees the support required by necessitous persons immediately, and as a well earned right;
2. it gives both employer and employee common interests in their duties, and thereby acts in a way as an instrument of social reconciliation;
3. it awakens a feeling of social duty throughout the nation; and
4. it strengthens the working and defensive power of the nation.

For further details please refer to the pamphlets "Leitfaden zur Arbeiterversicherung des Deutschen Reichs," "Einrichtung und Wirkung," "Entstehung und soziale Bedeutung," "Statistik der Deutschen Arbeiterversicherung," "Unfallverhütung und Arbeitshygiene," "Arbeiterversicherung und Volksgesundheit," and "Arbeiterversicherung und Volkswirtschaft," to be obtained at the "Deutsche Arbeiterversicherungs-Ausstellung" free of charge.

Dr. Zacher.

HYGIENE.

The increasing success with which the principles of modern hygiene have been applied to practical life have led to its development from the region of pure theory into a powerful factor influencing state administration in all its branches. Obedience to its laws has caused the recognition of the fact that the maintenance of the health of the individual is the chief requirement for the healthy growth of the state. In such places therefore where the nations of the earth meet in friendly competition to exhibit the results attained in manufacture, science and art, hygiene is beginning to occupy a prominent position. It was therefore the duty of Germany to show the educated public as well as the scientist at St. Louis, what has been accomplished by hygiene and to present in a special German hygienic exhibition, descriptions, illustrations and models of all discoveries which her scientific investigators have made as well as all practical achievements of her specialists in technical hygiene.

A recognition of the social-political principle that the working capacity of the human body is state capital which bears the highest interest, has been reserved for the present generation. This principle necessitates, the maintenance of a high degree of health in individuals and consequently imposes upon physicians not only the task of curing disease but that of preventing it. All progress in this direction is synonymous with economic gain. On the other hand health is the source of a nation's ability to defend itself, and the first condition for the recognition of a nation's power by other countries. The acknowledgement of this fact has induced Germany, in the last few years, to extend hygienic activity, hitherto applied solely in public affairs, to the preservation of the health of the individual. Influence is thus not only brought to bear on state and communal hygienic institutions but on the life of each individual, thus nurturing a race, powerful and robust enough to fulfill the tasks imposed on it by cultural progress.

All hygienic improvements in Germany, however, have not originated solely in utilitarianism, but have their source in spirit of brotherliness frequently found in circles having ideal views of life. The aim in view is to help the poor, the weak and the diseased, and thus, institutions are called into existence which simultaneously fulfill social-political demands. The wealthy classes do not hesitate to unite with the state and community in promoting hygienic interests, and this aid has found systematic and active expression, as will be shown later on. These private undertakings also include organisations devoted to special purposes, whether relating to the health of the individual or of the general public. The German Society for Public Hygiene stands at the head of these movements and for 28 years has endeavoured in itinerary meetings, to call the attention of authorities and private individuals to important hygienic problems, to aid in furnishing scientific and technical solutions and above all to educate the general public. The time-honoured meetings of German naturalists and physicians form a special group, and have propagated hygienic questions far and wide. The German Society for Popular Hygiene endeavours to improve the health of the individual in all directions, supplementing the work of the German Society for Public Hygiene. The German Red Cross Society has also included hygienic propaganda in its programme, and among other societies with similar aims may be mentioned The German Society for School Hygiene, the German Society for the Suppression of Quackery, the German Society for Public Baths, the German Committee for the Investigation of Cancer and the German Society for the Suppression of Sexual Diseases. The periodicals published by the various societies afford the general public a mass of instruction and at the same time offer ample material for treating the questions at issue.

The development of hygienic institutions in Germany is chiefly due to German science which has so ably adapted itself to the needs of life and has opened the way for practical work by careful and successful investigations. The Munich school, distinguished by the name of Max von Pettenkofer, introduced hygiene into public life. It is furthermore universally recognised that the great discoveries of Robert Koch are not only of vast scientific importance, but have proved of great value to public and private hygiene and practical veterinary science. The busts of these celebrated German men form the best artistic ornamentation of the German Hygienic Exhibition.

The participation of the government in public hygiene led to the formation of a central technical administrative institution, the Imperial Board of Health, directly subordinate to the Imperial Department of the Interior, and bearing the character of a council. This institution was called into existence towards the end of April 1876. Its duties consist in supporting the government in preparing and putting hygienic-police measures into practice and in observing their effects as well as in furnishing official information to the authorities in all cases, when required in observing the development of hygienic-police and medical legislation in foreign countries, and in compiling

medical statistics in Germany. In order to be capable of meeting increased demands and above all to supplement and test all scientific investigations by special experimental work, the Board of Health is furnished with laboratories which are constantly being extended and enlarged.

The Imperial Board of Health is aided by the Imperial Hygienic Council, which actively supports all the Federal governments in matters regarding public hygiene. A special committee of the Imperial Hygienic Council is engaged in compiling a German pharmacopoeia.

A large number of hygienic matters have been regulated in co-operation with the Imperial Board of Health, partly by government legislation or decisions of the Federal Council and partly by proposal of the administrations of the several Federal States. The most important regulations are those regarding the examination of physicians, veterinary, surgeons, dentists and apothecaries, the Vaccination Law of April 8th, 1874 the decision of the Federal Council of June 28th, 1899, concerning vaccination, the law enacted June 30th, 1900 for the suppression of diseases endangering public health, the rules for carrying this law into force, the measures for the suppression of typhoid fever, regulations for the transport of corpses, regulations concerning the police control of ships entering German harbours, the law passed May 14th, 1879 pertaining to trade in provisions, table delicacies and useful articles, the law passed $\frac{\text{June 23rd, 1880}}{\text{May 1st, 1894}}$ pertaining to the prevention and suppression of disease among animals, the law passed June 3rd, 1900 pertaining to the slaughter of animals and examination of meat, and the regulations for carrying this law into force.

The activity of those authorities concerned with the protection of workmen is no less important and extensive, and this includes in the broadest sense the social legislation for insurance against disease and old age. Factory inspectors supervise the various industrial enterprises, and take care that hygienic requirements are complied with in the workshops, especially in regard to ventilation, light and clean liness. Furthermore the interests of workmen are especially guarded by very strict legal provisions, in establishments exposing employees to danger, without however being detrimental to the work done in the establishment.

Based on trade regulations, the Imperial Regulations pertaining to trade in drugs were passed October 22nd 1901. These determine the drugs, the trade in which is restricted to apothecaries. In regard to trade in patent medicines, &c., the several governments have complied with a resolution of the Federal Council recommending the enactment of a law containing similar regulations; this has been in force since January 1st 1904.

The Imperial Board of Health has furthermore undertaken the grateful task of bringing hygienic instruction into house and family, school and workshop. Numerous popular printed pamphlets give evidence of the able manner in which a systematic enlightenment of the general public as to hygiene has been effected.

The administration of the medical and veterinary departments of the police is carried on by the governments of the various Federal States. Numerous laws have been passed by the several states in all those departments which are not yet administered by the Empire, as for instance, in the hygiene of dwellings, in the care of the insane, in midwifery, in the school hygiene, in the suppression of local infectious diseases, &c. These regulations are enforced by the local police authorities and they thus constitute a body constantly employed in safeguarding the welfare of the people.

The progress of German industry with its hosts of workmen in the large trade centres has considerably hastened the growth of cities. Such a rapid increase in the population of a city often exerts an injurious influence on its inhabitants. It was therefore no easy task for the respective communities to establish such institutions with circumspection and rapidity, which were capable of nullifying this danger, without disparaging the reputation of large German cities for being abodes of education, culture and health. The municipalities were and are equal to the task, as was proved by the exhibition of German cities, held last year at Dresden, which can be designated as a brilliant representation of German municipal institutions, German patriotism and municipal self-government. A selection has been made by experts from the hygienic articles exhibited there, and these seem to be especially adapted for exhibition at St. Louis. This part of the "German Hygiene" exhibit will be located in the Engineering Building of the Exposition, and will furnish evidence of the progress made in German hygienic technics by the indefatigable and effective co-operation of medical science with engineering skill.

Everything will be represented there which has any connection with the hygiene of communities, among which may be mentioned water supply and sewerage, hospitals and bathing establishments, building police and habitations, school hygiene and disinfection, slaughter houses and flaying establishments. A competent judge will find many objects showing the results of extensive research publicly exhibited for the first time. In the water supply exhibit one of the chief novelties is a process of removing bacteria from drinking water by ozonising it. The method of double irrigation is also new, whereby waste water which has once passed through fields can be utilized for agricultural purposes and rendered perfectly pure by conducting it over meadows before its outlet into an open water-course. The artistic wall-paintings exhibited by the Imperial Board of Health are both new and instructive. They represent the most important methods of water supply and sewerage in landscape style, and are intended to arouse interest and draw attention to their importance.

The international bathing resorts occupy a prominent hygienic place among German cities. Although their hygienic institutions have probably become well-known outside Germany through the annual visits of numerous foreigners, it has however seemed desirable to include them in the Exhibition in order to extend their reputation to wider circles. Exhibited under the direction of the

Royal Prussian Ministry for Agriculture, Domains and Forestry, it is to be hoped that the power of attraction of the German bathing resorts may be hereby increased.

Since the discoveries of Robert Koch, a revolution has taken place in Germany as regards practical methods of suppressing epidemics. This is shown by the special measures provided against the several kinds of infectious diseases. Every contagious disease has its peculiarities in regard to disease germs and method of spreading. Consideration was paid to this fact by adopting certain measures, and these will be represented in the exhibits.

A special chart represents the fact that drinking water is the chief point to be attacked in the struggle against Cholera. It is generally believed that the Plague is often dangerously spread by rats, and as none of the five continents of the world are free from Plague, every harbour is constantly in danger of being infected by ship rats which are afflicted with the disease. An apparatus for exterminating rats on ships, invented by a member of the Commission appointed by the Imperial Hygienic Council, will be greeted by all harbour authorities as a valuable weapon against the Plague.

All efforts to prevent small-pox from spreading would be fruitless if vaccination were not general, but the liability to contagion can be removed by means of vaccination. The great attention paid in every civilized country to the suppression of small-pox makes a demonstration of German legislation in regard to vaccination and the success which it been attained especially valuable. Small-pox is of enormous international interest. Owing to the rapidity of modern international intercourse by land and sea on the one hand and the long incubation period of this disease on the other (i. e. the time between contagion and breaking out of the disease) a person can for instance become infected in St. Petersburg and show the first symptoms after arrival on the Pacific coast, thus establishing a new centre for the disease.

The Vaccination law having been in force in Germany for 30 years the misery and terrors of an epidemic of small-pox are unknown to the present generation. As a native disease it is entirely unknown there, and if a case occurs now and again it is always one that has been imported from foreign countries. It is comprehensible, therefore, that such cases occur on the frontiers and in towns on the coast. The number of small-pox cases in Germany were as follows: 1898, 129; 1899, 346; 1900, 392; 1901, 375; 1902, 112.

In order to realise the significance of these small numbers they should be compared with those of the city of New York*) where 1,964 cases of small-pox were registered, and with St. Louis**) where 1,916 cases occurred during 1901.

The success of German vaccination legislation has been repeatedly recognized by foreign countries. It was pronounced excellent at the IX. International Congress for Hygiene and Demography in Madrid, and served as a pattern for the resolutions passed at the X. Congress held in Paris. The

*) Annual report of the Board of the Department of Health of the City of New York for the year ending December 31st, 1901 (p. 33).

**) Annual report of the Commissioner of Health for the year ending March 31st, 1902.

In 1877, 372 in 100,000 inhabitants died from consumption; in 1901, only 205·5.

In 1877 the mortality from diphtheria was 104; in 1901, 27 in 100,000 inhabitants.

During the last quarter of a century the mortality from measles decreased from 30 to 25 in 100,000, and from scarlet fever from 61 to 23·5.

Should further statistical information or other details be desired, a special catalogue of the German Hygiene Exhibition, published by the Imperial Board of Health, can be procured. This contains not only a list of exhibitors and articles exhibited, but a short description of each article, written in a comprehensible manner.

We trust that the exhibition will obtain the approval and interest of all those engaged in hygienic work, and that it will aid in extending the reputation of Germany as a healthy and progressive country to all parts of the world. By giving evidence of what science, investigation, state and community, trade and industry have accomplished in the service of a movement which aims at the welfare of mankind, the Exhibition will prove a great blessing in the future by furnishing precept and practice by which to fufil its noble aim of alleviating the sufferings and promoting the welfare of mankind.

Dr. Breger.

GERMAN CITIES.

From time immemorial the cities of Germany have been of importance, and within Germany itself they have always been the most powerful and influential factor in the commonwealth. The decline of German power which began during the disorders of the Thirty years War in the seventeenth century and continued through the eighteenth, checked them, however, in their development, and brought their growth to an early standstill.

Since the foundation of the German Empire, which was prepared by the economical union of the Federal States within the German Zollverein, the national strength of Germany has greatly increased, and the latent forces inherent in the Empire have been developed. Industry and trade grew from year to year in an unpredented manner, and under the German Eagle the export trade of the country has increased to such an extent that Germany is now second among the commercial nations of the world. Prosperity has increased throughout Germany; above all the population has grown with a rapidity unprecedented among European nations.

This great progress of Germany has been of the utmost possible benefit to its cities. People rushed to them in great numbers, and they grew with surprising rapidity. The population of Berlin soon rose to over a million (1,888,848 inhabitants in 1900) and Hamburg, Munich, Leipsic, Breslau and Dresden have either increased, or will increase to over half a million inhabitants within the next few years. This growth, however, has not been limited only to a few of the important business centers; it shows itself alike in the north,

south, east and west. Some of the cities, more especially industrial centers, show a sudden increase of population that is without precedent. For instance, Chemnitz had a population of 68,000 in 1871, and the census taken in 1900 totalled 182,000. This presented a new problem to municipalities. It was not possible to accomodate the sudden increase of population within the old city limits. New buildings had to be added. Endeavours were made to guide the growing activity in building into new paths, and to add and include new territory whilst strictly maintaining the old appearance and characteristics of the different towns. This new movement found its expression in city building. In the first German City-Exposition, held at Dresden in 1903, a great many city and building plans were exhibited, demonstrating how the cities strove to combine old systems with new and to accomplish the tasks before them. The result of this practical movement has been the development of a particular science during the last ten years, i. e., the art of municipal architecture, which is now taught in all German technical high schools. The question at stake is, how can new land be utilised in a systematic and practical manner by means of building laws and boundary regulations. Building plans, however, ought not to be designed according to geometrical rules, but ought to be governed by the exigencies of traffic and by artistic considerations, whereby as much care as possible should be taken to preserve the old appearance and historical character of the city. All the building plans in Germany show how carefully these rules are adhered to.

From time immemorial the condition and development of schools have been closely connected with the growth of cities. The state participates in this, as there are state as well as municipal schools with the same curriculum. The state establishes a minimum standard; the cities, however, go far beyond this moderate demand in satisfying educational requirements. Not only do they erect their school buildings, but they also furnish them with all means for instruction. They employ capable teachers and exert a comprehensive and beneficent guardianship over their scholars outside the school. No sooner is a young citizen of the German Empire born into the world than he is taken and cared for, if need be, at some public crêche; then, as soon as he can make free use of his limbs he enters the nursery-house, and from there he goes to the school where he has play-grounds and skating-rinks in winter and is taken on excursions into the country in the summer. In short, municipalities make every effort to supply their coming citizens with bodily strength as well as mental cultivation. In many cities more than half the annual expenditure is devoted to the maintenance of schools for the different stages of education "gymnasiums," "realschulen," higher elementary and peoples schools.

Two movements have come particularly to the fore during recent times, one of which is for encouraging the teaching of trades. As far back as the middle ages municipal commoners already did much in this direction. Then, simultaneously with a falling off in the work of artisans and guilds, a neglect in industrial education made itself apparent. Now, however, the cities are

taking the matter up again earnestly, not only to make up for lost time, to attain the higher standards required nowadays. Germany must open new fields, and this more thorough industrial education is intended to be a means to this end. State and municipality alike are untiring in their zeal in encouraging and assisting in this branch of education.

In another direction, but closely allied with this idea of industrial education, the cities are making progress, supported by the public spirit of their citizens, in the erection of high schools, commercial high schools, academies, &c., or where this is not expedient by establishing high school courses, so that their citizens may be in the closest connection with the progress of science.

In the care of the poor and sick as well as for purposes of public welfare, cities have to face new problems and difficulties every day. Here public and private beneficence go hand in hand, as their field of activity is the same. Benevolent citizens and societies for the promotion of public welfare unite in meeting to resist the evils which are closely connected with the advance of culture and prosperity. This work is ever increasing, and municipalities are constantly being called on to lend greater support to old institutions or to accept the responsibilities of new ones. The work includes the guardianship of foundlings and foster-children, providing warm rooms for the poor in winter, refuges for the homeless, offices where the unemployed may obtain work and employment bureaus. The hospitals, above all, constantly increase in their demands on the municipal exchequer. The requirements of physicians and patients grow from year to year, not only for hygiene but also for the erection of hospital buildings, so that the average expense for each single patient has risen considerably during the last ten years. The new hospitals in Germany have been erected in accordance with every demand of modern hygiene.

The gas, water and electric works are also in the hands of the municipal administration, and occupy a special position. The first municipal gas-works were erected at the beginning of the nineteenth century; they were private concerns, and a long time elapsed before cities erected their own gas-works, some remaining even now the property of private companies. The first central water-works were opened at Hamburg in 1849. Other cities soon followed the example, and a private company opened water-works in Berlin in 1856; it was not until 1873 that the city erected its own works. At present all the large and many of the smaller cities of Germany have their own water-works—and private companies have gone entirely out of existence. Electric power-plants were introduced at the expense or at the instigation of the city about 1880. These three undertakings, water, gas and electric works, form a very great source of revenue for cities, and indeed they often form the only important item in the receipts of many municipalities. Many other municipal institutions such as cemetries, market halls, flaying yards, loan offices, &c., are not as a rule very profitable institutions with the exception of savings-banks.

Great progress has been made during the last generation in underground construction. Increase of traffic as well as care for the public health are constantly making fresh demands. By constant improvement of sanitary conditions the rate of mortality has decreased very considerably. Statistics show that the death rate in Munich in the year 1894 was 6,400 less than the number at which it was estimated on the basis of the average mortality during the years 1871–75. Great attention is paid to the care of the streets, their clean appearance, the rapid removal of rain water by sewers, and flushing away the dirt wirth a plentiful supply of clean water; anyone judging objectively will not deny the benefit of these efforts, as through the German cities have won the repute of having the cleanest cities on the continent of Europe. In the construction of bridges, sluices, and the building of canals, the German technologist claims both originality and success.

There still remain comprehensive architectural and artistic problems to be solved by German municipal councils. From time immemorial the town hall has represented the dignity of the city. It should be fitted up with well ventilated council rooms and light large, and airy working rooms for the administrative officers, and be situated in a market place or other prominent position, as well as agree with the general appearance of the city; all in all, a task beset with many difficulties to be met and overcome by the architect. In spite of all this many of the new town halls in German cities thoroughly comply with these conditions. Besides the city hall as the most important building of the city, there are many other buildings serving different purposes, such as museums, theaters, schools, markets, baths, police, administrative buildings and fire-stations, hospitals and asylums, &c. Each one of these requires special architectural construction to meet its requirements. The rapid growth of the cities has greatly developed building activity. New artistic principles have been established during the last few years, and those persons who visited the Dresden Exposition were astonished to see the great variety of form and the marked individual character of architecture that many of the cities showed. As a mark of the increasing prosperity of the last ten years, renewed importance has been attached to the interior construction of houses, stairs, corridors, walls, doors, &c. The city of Munich is far ahead of any other German city in its schools, public baths, and in artistic interior decoration. Cities are also patrons of the small industries. They require diplomas and gold medals for awards, and attach great worth to the old city treasures of gold and silver, and add to them if possible. The highest city officials wear chains of gold and silver on all state occasions.

A comparatively new element making itself evident in German cities is the establishment of museums, which become the center of all that concerns the history of the city, and which also aim at collecting works of art.

Formerly it was the custom of royal courts to develop horticulture, and now the cities begin to do so more and more. They do not limit themselves to promenades, parks, and squares, but where there is room plantations are formed around the hospitals, slaughter houses, and particular

attention is paid to the laying out of cemeteries, so that everyone is able to share in nature's gifts, and the city is beautified.

Since the foundation of the German Empire the cities have broken their old bonds, and are no longer simple governing bodies clinging to historical traditions, or only executing what the state initiates. They have a higher goal, as they stand in mutual relationship with everything which denotes progress. They aim at representing German civilisatory endeavours of the present day. They do not desire to stand aloof from the people, but among them.

This ideal is of course only attainable if the municipal authorities are conformable and adaptable. They must be able to follow the manifold progress of the inhabitants, and are able to do so owing to their organisation. The basis for all this was laid down in the great Stein-Hardenberg period. It contained the principles of the co-operation of municipal government with the people, and the close connection between professionally trained officials of the co-operative body and prominent citizens. The fact acknowledged throughout the civilised world that German city government is not bureaucratic is largely to be attributed to the popular element infused into it. This is also recognised abroad. Edmund J. James writes as follow:*) "The common motion that Prussia is governed by a bureaucracy is nowhere more strikingly refuted than in the city administration, and one may say in local administration in general. In no large country of the world is greater care taken to provide that a decision, so far as it involves the question of expediency in any important public matter, shall not be made by one man, than in the Kingdom of Prussia. The whole spirit of the Stein and Hardenberg reforms involved, in one direction at least, the active participation of the lay element as distinct from the professional element, in the administration of public affairs, and this principle has found the most extensive application in every department of local government in Prussia. Nothing can be done in the sphere of civil administration except by boards which contain to a large extent a lay element, that is a non-professional element."

Of the extended activity of the administration in German cities very little is evident. When, at the instigation of Oberbürgermeister Beutler supported by the hearty co-operation of the German cities the first City-Exposition was opened in Dresden 1903, this was shown in a surprising manner. It had not been excepted either that the Exposition would attract many visitors or find general acknowledgment, but throughout Germany the Exposition was regarded as unique. The number of visitors increased from month to month. For the first time an extended picture of municipal government was unrolled before the world, and a deep impression was made on everyone by this insight into a domain usually closed. In order to preserve a lasting impression of the exhibits, a book has been compiled by the under-

*) Edmund J. James: Municipal administration in Germany as seen in the government of a typical Prussian city, Halle-on-the-Saale, Chicago, 1901. The University of Chicago studies in political science. P. 17, &c.

signed on the subject entitled "Die deutschen Städte" with the assistance of a number of government officials and professors, at the express desire of the Exposition authorities (published by Friedrich Brandstetter, Leipsic, 1904).

The tasks at present before the German cities are imposed firstly by the, increase of population, secondly by the form of present day economics. These are the problems with which nearly every civilised nation has to cope with. The German cities in the present exhibition show what they are now doing to promote public welfare.

Robert Wuttke.

LIST OF EXHIBITORS

26 Deutsche Linoleum- und Wachstuch-Compagnie * Rixdorf (Berlin) * Linoleum floor covering. See grp. 43 p. 461.

27 August Gerber, Kunstanstalt * Cöln a. Rh. * 20 Busts. See grp. 33 p. 442.

28 L. Kayser, Tischlerei * Berlin * Doors. See grp. 37 p. 457.

29 Kimbel & Friederichsen * Berlin * Furniture. See grps. 37 and 38 p. 457 and 458.

30 Prof. Max Koch, Artist * Berlin * 3 paintings: Views of Berlin, Dresden and Lübeck. See grp. 37 p. 457.

31 Regina-Bogenlampenfabrik, G. m. b. H. * Cöln a. Rh. * 2 Arc lamps. See grp. 69 p. 472.

32 Max Rossbach, Artist * Solln near München * 3 paintings: Views of Nürnberg, Ulm and of the Hohkönigsburg. See grp. 37 p. 457.

32a F. Volckmar, Sortimentsbuchhandlung * Leipzig * Library in the Library bookcases. See grp. 17 p. 411.

Office.

33 Delmenhorster Linoleumfabrik * Delmenhorst bei Bremen * Linoleum floor covering and Lincrusta wall hangings. See grp. 43 p. 461.

34 L. Kayser, Tischlerei * Berlin * Doors. See grp. 37 p. 457.

35 Regina-Bogenlampenfabrik, G. m. b. H. * Cöln a. Rh. * 2 Arc lamps. See grp. 69 p. 472.

36 Emil Schmitz, Garden designer * Düsseldorf * Design of Garden for the German State Building. Grp. 105 Cl. 626.

37 Shannon-Registrator-Co. (August Zeiss & Co.) * Berlin * Furniture. See grp. 38 p. 459.

37a G. Wölfel, Marqueteur * Stuttgart * Inlaid picture. Designed by Prof. Hans Christiansen, Darmstadt. See grp. 37 p. 456.

Main Staircase.

38 Barmer Teppichfabrik Vorwerk & Co. * Barmen * Staircase carpet. See grps. 37 and 43 p. 449 and 461.

39 Deutsche Steinindustrie-Aktiengesellschaft, vormals M. L. Schleicher * Berlin * Marble floor. Round marble table. See grp. 37 p. 456.

40 Richard Guhr, Artist * Berlin * Paintings on ceilings. See grp. 37 p. 456.

41 Königliche Porzellanmanufaktur * Berlin-Charlottenburg * Ornaments. See grp. 45 p. 464.

42 Schulz & Holdefleiss, Kunstschmiedewerkstatt * Berlin * Forged bronze balustrade. See grp. 37 p. 457.

Verandah.

43 Regina-Bogenlampenfabrik, G. m. b. H. * Cöln a. Rh. * 3 Arc lamps. See grp. 69 p. 472.

44 Villeroy & Boch * Mettlach (Rheinpreussen) * Tiles to floor. See grp. 45 p. 465.

II. First Story.

Hall.

45 J. Blüthner * Leipzig * Grand piano. See grp. 21 p. 416.

46 Kimbel & Friederichsen * Berlin * Furniture. See grps. 37 and 38 p. 457 and 458.

47 Prof. W. von Ruemann * München * Hermes of Bismarck and Moltke. See grp. 11 p. 400.

48 W. Ziesch & Co., Court art weaver * Berlin * Gobelin upholstery to the furniture. See grp. 43 p. 463.

Gobelin Hall.

49 Conrad Astfalck * Berlin * 4 painted copies of Gobelins. See grp. 37 p. 456.

50 Barmer Teppichfabrik Vorwerk & Co. * Barmen * Floor carpet. See grps. 37 and 43 p. 449 and 461.

51 W. Bernau * Berlin * Wall hangings and upholstery. See grp. 44 p. 463.

52 Detmolder Stuckfabrik Albert Lauermann * Detmold * Stucco ceiling. See grp. 37 p. 456.

53 Gebrüder Friedländer, Court jewellers * Berlin * Jewellry. See grp. 31 p. 440.

54 H. Frost & Söhne, Bronzewarenfabrik * Berlin * Lighting fittings. See grps. 33 and 41 p. 442 and 460.

55 L. Kayser, Tischlerei * Berlin * Wainscotting of walls and doors. See grp. 37 p. 457.

56 Kimbel & Friederichsen * Berlin * Exhibition cupboard. See grps. 37 and 38 p. 457 and 458.

57 Königliche Porzellanmanufaktur * Berlin-Charlottenburg * Ornaments. See grp. 45 p. 464.

58 Carl Typke * Berlin * Wax candles.

Brandenburg Chamber.

59 Barmer Teppichfabrik Vorwerk & Co. * Barmen * Carpet to floor. See grps. 37 and 43 p. 449 and 461.

60 W. Bernau * Berlin * Upholstery. See grp. 44 p. 463.

61 Detmolder Stuckfabrik Albert Lauermann * Detmold * Stucco ceiling. See grp. 37 p. 456.

62 L. Kayser, Tischlerei * Berlin * Wainscotting to walls and doors. Cupboard for silver plate. See grp. 37 p. 457.

63 Marno Kellner * Charlottenburg * Painting and gilding on ceilings. See grp. 37 p. 457.

64 Kimbel & Friederichsen * Berlin * 3 brackets in silver cupboard. See grp. 38 p. 458.

65 Königliche Porzellanmanufaktur * Berlin-Charlottenburg * Ornaments. See grp. 45 p. 464.

66 Gebrüder Röhlich * Berlin * 2 Picture frames. See grp. 38 p. 459.

67 Prof. Otto Rohloff * Berlin * Timepiece. See grp. 33 p. 443.

68 Thiele & Steinert * Berlin * Silver lace. See grp. 58 p. 468.

69 Hermann Verwiebe, Artist * Pankow * Portraits of the Great Elector and his consort Louise Henriette. See grp. 37 p. 457.

70 Wilhelm Vogel * Chemnitz * Red wall hangings. See grp. 43 p. 463.

Oak Gallery.

71 Barmer Teppichfabrik Vorwerk & Co. * Barmen * Staircase carpet. See grps. 37 and 43 p. 449 and 461.

72 Eckstein & Kahn, Leinwand- und Tischzeugweberei * Stuttgart * Damask table cloths. See grp. 55 p. 466.

73 August Gerber, Kunstanstalt * Cöln a. Rh. * 12 Busts. See grp. 33 p. 442.

74 Königliche Porzellanmanufaktur * Berlin-Charlottenburg * Ornaments. See grp. 45 p. 464.

75 Opderbecke & Neese * Düsseldorf * 12 marble pedestals. See grp. 37 p. 457.

76 Gebrüder Röhlich * Berlin * Wall wainscotting and doors. See grp. 38 p. 459.

77 Helene Schulz, Artist * Berlin * Portraits of King Frederick the First and his consort Sophie Charlotte above the doors and 7 pictures in niches. See grp. 37 p. 457.

78 August Unger, Artist * Berlin * Paintings on ceiling. See grp. 37 p. 457.

Galloon Hall.

79 Arnold & Braun, Kunstweberei * Crefeld * Silk damask. See grp. 57 p. 467.

80 Barmer Teppichfabrik Vorwerk & Co. * Barmen * Carpet to floor. See grps. 37 and 43 p. 449 and 461.

81 Deutsche Steinindustrie-Aktiengesellschaft, vorm. M. L. Schleicher * Berlin * 2 marble mantlepieces. See grp. 37 p. 456.

82 Königliche Porzellanmanufaktur * Berlin-Charlottenburg * Ornaments. See grp. 45 p. 464.

83 Gebrüder Röhlich * Berlin * Wainscotting on walls, doors and upholstery. See grp. 38 p. 459.

84 Helene Schulz, Artist * Berlin * Portraits of the Great Elector and his consort Sophie Dorothea above the doors. See grp. 37 p. 457.

85 Franz Spengler * Berlin * Mounts on doors. See grp. 41 p. 460.

86 Tröltsch & Hanselmann * Weissenburg am Sand (Bayern) * Braids. See grp. 58 p. 468.

87 August Unger, Artist * Berlin * Paintings on ceiling. See grp. 37 p. 457.

88 J. H. Werner, Court Jeweller * Berlin * Artistic silvermiths work. See grp. 31 p. 440.

Terrace.

89 Frost & Söhne, Bronzewarenfabrik * Berlin * 2 forged wall brackets. See grps. 33 and 41 p. 442 and 460.

90 Regina-Bogenlampenfabrik, G. m. b. H. * Cöln a. Rh. * 2 Arc lamps. See grp. 69 p. 472.

91 Villeroy & Boch * Mettlach (Rheinprovinz) * Tiles on floor. See grp. 45 p. 465.

III. Belfry.

92 Prof. Christian Behrens * Breslau * Group of arms and figures "Power" and "Wisdom." See grp. 37 p. 456.

93 Bochumer Verein * Bochum * Cast steel chimes. International (Paris) pitch,

A sharp bell, 1,882 mms. diameter, 2,668 kgs., C sharp bell, 1,574 mms. diameter, 1,641½ kgs., E bell, 1,387 mms. diameter, 1,078 kgs. See grp. 118 p. 494.

94 Hugo Bremer, Neheimer Metallwaren- u. Werkzeugfabrik * Neheim a. d. Ruhr * Bremer lamps. See grp. 69 p. 472.

95 C. Conradty, Fabrik elektrischer und galvanischer Kohlen * Nürnberg * Carbon points. Representative: Hugo Reisinger, 11 Broadway, New York. Carbons for Bremer lamps and searchlight. See grp. 69 p. 472.

96 C. F. Rochlitz, Grossuhrenfabrik * Berlin * Works and dial of Clock. See grp. 32 p. 441.

97 Siemens-Schuckertwerke, G. m. b. H. * Berlin * Searchlight. See grp. 69 p. 472.

IV. Terraces and Gardens.

98 Aktiengesellschaft Lauchhammer * Lauchhammer (Provinz Sachsen) * Bronze casting of a model for a Steuben monument and fountain figure "Evening." See grp. 33 p. 441.

99 Prof. Christian Behrens * Breslau * Designs of 2 ornamental flagstaff feet and 2 candelabras on the main flight of steps. See grp. 37 p. 456.

100 Boswau & Knauer, G. m. b. H. * Berlin * Masonry, brickwork, &c. of Pergola. See grp. 27 p. 428.

101 Deutsche Gasglühlicht-Aktien-Gesellschaft * Berlin * Burners, incandescent mantles, cylinders. See grp. 49 p. 466.

102 Gladenbeck's Bronzegiesserei, Owner Hermann, Alfred and Walter Gladenbeck * Friedrichshagen near Berlin * Bronze feet of flagstaffs. See grp. 33 p. 442.

103 R. Herrmann, Art locksmith * Berlin * Wrought iron railing to the rear hind façade of the German State Building. See grp. 33 p. 442.

104 Rudolph Hertzog * Berlin * 2 embroidered flags. See grp. 44 p. 463.

105 G. Knodt, Metallwarenfabrik * Frankfurt a. M. * 2 Candelabras to the main flight of steps. See grp. 33 p. 443.

106 Emil Schmitz, Garden designer * Düsseldorf * Laurels. Grp. 111 Cl. 649.

107 Schulz & Holdefleiss, Kunstschmiedewerkstatt * Berlin * Gas lanterns. See grp. 41 p. 460.

108 Rudolph Seidel * Grüngräbchen near Schwepnitz i. S. * 12 large circular Rhododendrons. Grp. 108 Cl. 641.

109 Prof. Kuno von Uechtritz, Sculptor * Berlin * Model to Steuben monument, fountain figure "Evening." See grp. 11 Cl. 30 and grp. 33 p. 444.

110 Weber-Falckenberg * Berlin * Fireproof linen cover to roof of the Pergola. See grp. 25 p. 427.

V. German Wine Restaurant.

111 M. Ballin, Court purveyor * München * Wainscotting to walls and furniture. See grp. 38 p. 458.

112 A. Bertuch * Berlin * Kitchen fittings. See grp. 45 p. 463.

113 B. Bohrmann Nachfolger, Fabrik versilberter Tafelgeräte * Frankfurt a. M. * Silver plated domestic utensils. See grp. 30 p. 438.

114 Deutsche Linoleum- und Wachstuch-Compagnie * Rixdorf-Berlin * Linoleum floor covering. See grp. 43 p. 461.

115 H. Frost & Söhne * Berlin * Lighting fittings. See grps. 33 and 41 p. 442 and 460.

116 Adolf Grunow, Gebhardt & Rössel Nachf. * Berlin * Carpet. See grp. 43 p. 462.

117 Rudolph Hertzog * Berlin * Curtains to windows and over doors. See grp. 58 p. 468.

118 Hildesheimer Sparherdfabrik, A. Senking * Hildesheim * Kitchen fittings. See grp. 48.

119 L. Kayser, Tischlerei * Berlin * Furniture: tables, chairs, bar. See grp. 37 p. 457.

120 Kons & Pfennings, Court caterers * Berlin * Catering.

121 Julius Lennhof * Berlin * Table lamps * See grp. 33 p. 443.

121a Otto Metz & Co. * Cöln am Rhein * Papers for trays and other paper articles for the Restauration of the German State Building.

122 Emil Schumacher * Bielefeld * Table linen. See grp. 55 p. 466.

123 E. A. Schumann, Court purveyor * Berlin, Leipziger Str. 107 * Porcelain, glass and crystal wares. See grp. 45 and 47 p. 465 and 466.

124 Gebrüder Thonet (aus Wien) * Berlin * Garden furniture. See grp. 38 p. 459.

125 August Unger, Artist * Berlin * Paintings on ceiling. See grp. 37 p. 457.

Department A.
Education.
Education Building.

1. German Education Exhibition.
Groups 1 to 4, 6 to 8, 18 to 20, 23, 68, 69, 71, 77 and 142 to 144.

Management: Geh. Ober-Reg.-Rat Dr. Schmidt, vortragender Rat im Kgl. Preuss. Ministerium der geistlichen, Unterrichts- und Medizinal-Angelegenheiten.

Separate Exhibition of the Royal Prussian Ministry of Education in Berlin.

I. General.

135 Kgl. Unterrichtsministerium Berlin * "German Education," a systematic representation of the whole method of German education, in four volumes by Geh. Reg.-Rat Prof. Dr. Lexis of Göttingen and numerous expert collaborators (extracts in English).

136 August Gerber, Kunstanstalt * Cöln a. Rh. * Busts of prominent scientists.

Exhibition of Universities, Technical High Schools and other scientific institutions.

II. Academies of Science and other scientific institutions.

137 Kgl. Akademie der Wissenschaften zu Berlin.

138 Kgl. Gesellschaft der Wissenschaften zu Göttingen.

139 Kgl. Akademie der Wissenschaften zu München.

140 Kgl. Gesellschaft der Wissenschaften zu Leipzig.

Publications of the above corporations.

Kgl. Unterrichtsministerium Berlin * Building plans of the projected Royal Library and Academy of Sciences in Berlin. Picture of the new building by Grete Waldau, Berlin. Projected building of the Aeronautic Observatory at Lindenberg. Water colour picture by E. Palm, Berlin. 141

III. Scientific Enterprises.

Kgl. Schlossbauverwaltung zu Homburg v. d. H. * Restoration of the Saalburg, the best preserved Roman fort on German soil (1st to 3rd century A. D.) near Homburg in the Taunus mountains (Geh. Baurat Jacobi). Models, drawings, books, copies of objects found. 142

Kgl. Unterrichtsministerium Berlin * Excavations at Baalbek (Heliopolis in Syria). Large photographs made by the "Kgl. Messbildanstalt zu Berlin." 143

Generalverwaltung der Kgl. Museen zu Berlin * Water colour painting, two lions and two dragons, as well as of a mosaic, representing objects found during the excavations of the German Oriental Society on the site of ancient Babylon. 144

Deutsche Orientgesellschaft zu Berlin * Plans of the excavations in Babylon and Abusir (Egypt). 145

IV. Universities.

Kgl. Unterrichtsministerium Berlin * Building plans of Universities and University institutes. Perspective draw- 146

ings of the new buildings of the Institute of Hygiene and the I. Chemical Institute of the Berlin University. Photographs of the new buildings and the internal arrangements of the Kgl. Charité Hospital in Berlin and the University infirmaries connected with it. Building plans of new edifices. Water colour painting of the new buildings by Theuerkauf, Berlin. The new Botanical Garden at Dahlem, near Berlin. Oil painting by Martini, Berlin.

147 Kgl. Messbildanstalt zu Berlin, Schinkelplatz 6 * (Geh. Baurat Prof. Dr. Meydenbauer.) Large photographs of University buildings at Breslau and Marburg.

148 Universität Marburg * Copies of the wall paintings in the University Hall.

149 Akademischer Ruderverein zu Berlin * Water colour sketch of the Club Boathouse at Grünau near Berlin.

150 Kgl. Julius-Maximilians-Universität zu Würzburg * Plan of site with ground plans of the various University buildings. Photographs of University buildings and institutes.

151 Kgl. Universität Leipzig * Plan of site with ground plans of the various University buildings and institutes.

V. Technical Colleges.

152 Kgl. Technische Hochschule zu Berlin-Charlottenburg * Models, photograms and graphic tables. Perspective drawings.

153 Kgl. Unterrichtsministerium Berlin * The new Technical College at Danzig. Water colour picture by E. Palm, Berlin.

154 Kgl. Sächsisches Ministerium für Kultus und Unterricht zu Dresden * Model and ground plan of new buildings for the mechanical department of the Technical College at Dresden.

VI. Other Technical Colleges.

155 Kgl. Sächsische Bergakademie zu Freiberg i. S. * Publication "The Royal Saxon Mining Academy at Freiberg and the Royal Geological Provincial Institution; information regarding the development and state of mining and smelting as well as about the mine police in the Kingdom of Saxony; published by the Royal Academy of Mines."

156 Städtische Handelshochschule zu Cöln a. Rh. * Plans, views and graphic representations.

VII. Lecture Hall.

Max Kohl * Chemnitz * Fittings of lecture hall and apparatus for excluding te light. 157

Prof. Dr. Miethe * Charlottenburg * Three colour projection apparatus with photographs. 158

P. Johs. Müller & Co. * Berlin, Hedemannstr. 15 * Lecture hall benches with desks. 159

Carl Zeiss, Optische Werkstätte * Jena * Epidiascopic apparatus. 160

VIII. Other exhibits of the College Exhibition.

Kgl. Unterrichtsministerium Berlin * Map of the German Empire, showing all the Colleges. 161

IX. Chemical Exhibition.

(Electricity Building.—See grp. 23 p. 417.)

a) Literary works.

Prof. Dr. F. B. Ahrens * Breslau, Matthiasplatz 8. 162

Prof. Dr. Anschütz * Bonn-Poppelsdorf. 163

Joh. Ambrosius Barth, Publisher * Leipzig. 164

Prof. Dr. Blochmann * Königsberg, Universität. 165

Prof. Dr. Borchers, Geh. Reg.-Rat * Aachen, Technische Hochschule. 166

Prof. Dr. Bredig * Heidelberg, Römerstrasse 36. 167

Prof. Dr. von Buchka, Geh. Reg.-Rat * Berlin W., Keithstr. 21. 168

Prof. Dr. A. Classen, Geh. Reg.-Rat * Aachen, Technische Hochschule. 169

Deutsche chemische Gesellschaft * Berlin, Hofmannhaus. 170

Prof. Dr. Karl Elbs * Giessen, Universität. 171

Prof. Dr. E. Fischer, Geh. Reg.-Rat * Berlin, Universität. 172

Prof. Dr. Ferdinand Fischer * Göttingen, Universität. 173

Prof. Dr. C. Harries * Berlin, Universität. 174

Prof. Dr. Hempel, Geh. Hofrat * Dresden, Technische Hochschule. 175

176 Prof. Dr. Jacobson * Berlin, Hofmannhaus.

177 Prof. Dr. Klinger * Königsberg, Universität.

178 Wilh. Knapp, Publisher * Halle a. S.

179 Prof. Dr. J. König, Geh. Reg.-Rat * Münster, Universität.

180 Prof. Dr. Krause * Köthen * Editor of the Chemiker-Zeitung.

181 Prof. Dr. O. Kühling * Charlottenburg, Technische Hochschule.

182 Prof. Dr. Ladenburg, Geh. Reg.-Rat * Breslau, Universität.

183 Dr. Edm. O. von Lippmann * Halle a. S.

184 Prof. Dr. Ernst von Meyer, Geh. Hofrat * Dresden, Technische Hochschule.

185 Prof. Dr. W. Nernst * Göttingen, Universität.

186 Prof. Dr. Ostwald, Geh. Hofrat * Leipzig, Universität.

187 Prof. Dr. Pinner, Geh. Reg.-Rat * Berlin, Veterinary College.

188 Prof. Dr. E. Rimbach * Bonn, Universität.

189 Jacques Rosenthal, Dealer in second-hand books * München.

190 Leopold Voss, Publisher * Hamburg.

191 Prof. Dr. O. Wallach, Geh. Reg.-Rat * Göttingen, Technische Hochschule.

192 Dr. Edgar Wedekind, Privatdozent * Tübingen, Universität.

193 Prof. Dr. Hans Wislicenus * Tharandt i. S., School of Forestry.

194 Prof. Dr. Wolffenstein * Charlottenburg, Technische Hochschule.

Busts.

195 August Gerber * Cöln a. Rh. * 1st Chemical Institute, Berlin.

b) Historical Section.

Alchemistic Laboratory of the 15th–17th century.

Liebig's Laboratory at Giessen in 1835.

196 I. Chem. Inst. Berlin (Geheimrat Prof. Dr. E. Fischer und Prof. Dr. C. Harries). * Collections of preparations and apparatuses of Liebig, Wöhler and A. W. von Hofmann.

197 Chem. Inst. Bonn (Geheimrat Prof. Dr. Anschütz) * Collection of preparations of Aug. Kekulé.

198 Prof. Dr. Alexander Mitscherlich * Freiburg i. B. * Collection of preparations of Eilh. Mitscherlich.

199 Prof. Dr. A. Naumann, Geh. Hofrat * Giessen * Copies of Liebig's original apparatuses.

c) General and Inorganic Chemistry.

Analysis of gasses.

200 Prof. Dr. Brunck * Freiberg i. S., Kgl. Sächs. Bergakademie * Apparatuses for analysis of gasses.

201 Prof. Dr. Bunte, Geh. Hofrat * Karlsruhe i. Baden * Bunte's burettes.

202 Prof. Dr. Ferdinand Fischer * Göttingen, Hohe Str. 1 * Apparatuses for analysis of gasses, calorimeters.

203 Prof. Dr. Hempel, Geh. Hofrat * Dresden, Technische Hochschule * Apparatuses for analysis of gasses and smoke gasses.

204 Friedrich Lux * Ludwigshafen a. Rh. * Gas balance.

205 Dr. Heinrich Poeckel * Berlin, Königgrätzer Str. 19 * Standard volumetric apparatuses.

206 Vereinigte Fabriken für Laboratoriumsbedarf G. m. b. H. (Max Kähler und Martini, Dr. Peters und Rost) * Berlin N., Chausseestr. 3 * Apparatuses for analysis of gasses.

207 Prof. Dr. Clemens Winkler, Geh. Hofrat * Dresden, Terrassenufer 3 * Apparatuses for analysis of gasses.

208 Prof. Dr. Wohl * Berlin N., Hessische Str. 1 * Apparatuses for analysis of gasses.

Laboratory Apparatus.

209 Prof. Dr. Anschütz, Geh. Reg.-Rat * Bonn, Universität * Apparatuses for the determination of boric acid.

210 Prof. Dr. Ernst Beckmann, Geh. Hofrat * Leipzig, Universität * Spectroscopic apparatuses for educational purposes.

211 Prof. Dr. Ernst Erdmann * Charlottenburg, Leibnizstr. 80 * Improved Bunsen burner.

212 W. C. Heraeus, Platinschmelze * Hanau * Quartz vessels, electrical resistance furnace for determination of molecular weights. Quartz-glass lamp.

213 Prof. Dr. Meyerhoffer * Berlin W., Uhlandstrasse * Models for explaining the Stassfurt potassium salts theoretically.

214 Prof. Dr. Ost * Hannover, Technische Hochschule * Models and diagrams for technological instruction.

215 Kgl. Preuss. Porzellanmanufaktur * Berlin * Porcelain vessels and apparatuses for chemical laboratories.

216 Prof. Dr. Otto Ruff * Berlin NW., Thomasiusstr. 21 * Various apparatuses.

217 Franz Schmidt & Haensch * Berlin S. 42, Prinzessinnenstr. 16 * Spectroscopic apparatuses.

218 Schott und Genossen, Glashütte * Jena * Vessels of durable glass for chemical purposes.

219 Prof. Dr. Staedel, Geh. Hofrat * Darmstadt, Herdweg 76 * Apparatus for the preparation of crystalline peroxide of hydrogen.

220 Dr. A. Stock, Privatdozent * Berlin N., Hessische Str. 1 * Apparatuses for research work with liquefied gases.

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222 Prof. Dr. Wichelhaus, Geh. Reg.-Rat * Berlin NW., Gr. Querallee * Apparatus for preparing sulphuric anhydride.

223 Prof. Dr. Clemens Winkler, Geh. Hofrat * Dresden, Terrassenufer 3 * Model of a factory for making sulphuric acid by the contact process.

224 Prof. Dr. Hans Wislicenus * Charandt i. Sachsen * Apparatuses for analytical work.

Apparatuses for determining molecular weights.

225 Prof. Dr. Ernst Beckmann, Geh. Hofrat * Leipzig, Universität * Apparatuses for determining the depression of the freezing point and the raising of the boiling point.

226 Prof. Dr. Heinrich Biltz * Kiel, Holtenaustr. 148 * Apparatuses for the determination of density of vapour by Victor Meyer's method.

Dr. W. Biltz, Privatdozent * Göttingen * 227
Apparatuses for determining the density of vapour by Victor Meyer's method.

W. C. Heraeus, Platinschmelze * Hanau * 228
Furnace with iridium bulb for determining the vapour density of metals.

Prof. Dr. Walther Nernst * Göttingen, 229
Bürgerstr. 50 * Furnace with iridium bulb for determining the vapour density of metals, and sensitive balance of quartz filaments for the same purpose.

Prof. Dr. Pfeffer, Geh. Hofrat * Leipzig, 230
Linnéstr. 1 * Historical apparatuses for measuring osmotic pressure.

Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H. * Berlin, Chausseestrasse 3 * Apparatuses for determining the density of vapour by Victor Meyer's method. 231

Prof. Dr. Otto Wallach, Geh. Reg.-Rat * 232
Göttingen, Universität * Apparatuses for determining the density of vapour by Victor Meyer's method.

Radioactive substances and phenomena of fluorescence.

Prof. Dr. W. Marckwald * Berlin W., 233
Kurfürstendamm 240 * Radioactive tellurium and apparatuses for its demonstration.

Prof. Dr. Meyer * Braunschweig, Technische Hochschule * Apparatuses for demonstrating the phenomena of fluorescence. 234

Inorganic preparations.

Scientific preparations:

Prof. Dr. O. Brunck * Freiberg i. S. * 235
Historical preparations of indium made by Th. Richter and Cl. Winkler;—historical samples of metals of the Freiberg mining industry.

Dr. H. Grossmann, Privatdozent * Münster i. W., Universität * Double salts; Barium-copper cyanide. 236

Prof. Dr. Ladenburg, Geh. Reg.-Rat * 237
Breslau, Kaiser-Wilhelm-Str. 108 * Derivatives of silicon.

Prof. Dr. Michaelis * Rostock i. M., 238
Universität * Suboxide of phosphorus.

Prof. Dr. Paal * Erlangen, Universität * 239
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Dr. Rosenheim, Privatdozent * Berlin 240
NW., Alsenstr. 3 * Double salts of antimony.

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246 Prof. Dr. Clemens Winkler, Geh. Hofrat * Dresden, Terrassenufer 3 * Germanium and derivatives; hydrides of the metals of the alkaline earths.

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248 Prof. Dr. Wohl * Berlin N., Hessische Str. 1 * Chloride of sulphuryl.

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258 Chemische Fabrik Gernsheim-Heubruch * Mannheim.

259 Chemische Fabrik Griesheim-Elektron.

260 Chem. Fabrik Hönningen vorm. Walther Feld & Co., Akt.-Ges. * Hönningen a. Rh.

261 Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M.

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399 Prof. Dr. O. Wallach, Geh. Reg.-Rat * Göttingen, Universität * Comprehensive collection of terpene derivatives and sesquiterpenes.

Technical preparations of the wholesale chemical trade.

Ethereal oils, vanilline, ionone, perfumes and dyestuffs for colouring same.

400 Aktiengesellschaft für Anilinfabrikation * Berlin.

401 C. F. Boehringer & Söhne * Waldhof bei Mannheim.

402 Chemische Fabrik Gernsheim-Heubruch * Mannheim.

403 Giesel & Co. * Dresden.
See advertisements p. 13.

404 Haarmann & Reimer * Holzminden.

405 E. Merck * Darmstadt.

406 E. Sachsse & Co. * Leipzig.

Heterocyclical compounds and alkaloids.

Scientific preparations:

407 Prof. Dr. Busch * Erlangen, Universität * Cyclical thio-derivatives of phenylhydrazin.

408 Prof. Dr. Dennstedt * State Laboratory, Hamburg * Pyrrol and homologues.

409 Prof. Dr. Doebner * Halle a. S., Universität * Synthesis of quinaldine.

410 Prof. Dr. E. Fischer, Geh. Reg.-Rat * Berlin, Universität * Methylketol.

411 Prof. Dr. Freund * Frankfurt a. M., Stiftstrasse 32 * Decomposition of Thebaïne and hydrastine.

412 Prof. Dr. Gabriel * Berlin, Universität * Pyrazines; pyrimidines; synthesis of isoquinoline.

413 Prof. Dr. Harries * Berlin, Universität * Eucaïne B.; euphthalmine.

414 Prof. Dr. Knorr, Geh. Hofrat * Jena, Universität * Derivatives of pyrrol, morpholine and pyrazol; antipyrine; decomposition of morphine.

415 Prof. Dr. Ladenburg, Geh. Reg.-Rat * Breslau, Universität * Synthesis of piperidine, pyridine and homologues; coniine; atropine series.

416 Prof. Dr. Liebermann, Geh. Reg.-Rat * Technical High School, Berlin * Ecgonine, tropine and derivatives.

417 Prof. Dr. Paal * Erlangen, Universität * Quinazoline.

418 Prof. Dr. Pinner, Geh. Reg.-Rat * Berlin, Veterinary College * Nicotine; pilocarpine; tetrazines.

419 Dr. R. Pschorr, Privatdozent * Berlin, Universität * Attempts at synthetical preparation of morphine.

420 Dr. Rohde, Privatdozent * Technical High School, München * Decomposition of quinine.

Prof. Dr. Stoehr * University of Kiel * Pyrazines. 421

Prof. Dr. Wolffenstein * Charlottenburg, Technische Hochschule * Atropine, nicotine oxide. 422

Technical preparations of the wholesale chemical trade.

Pyridin, Quinoline, Alkaloids and similar substances.

Aktiengesellschaft für Teer- und Erdöl-industrie * Berlin. 423

C. F. Boehringer & Söhne * Waldhof bei Mannheim. 424

Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M. 425

Kalle & Co. * Biebrich a. Rh. 426

Knoll & Co. * Ludwigshafen a. Rh. 427

Dr. L. C. Marquart * Beuel a. Rh. 428

E. Merck * Darmstadt. 429

Dr. Th. Schuchardt * Görlitz. 430

e) Laboratory for dyeing.

Dr. Lange * Royal dyeing School, Crefeld. 431

Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H. * Berlin N., Chausseestrasse 3 * Apparatuses. 432

Carl Zeiss, Optisches Institut * Jena * Spectroscope. 433

The dyed samples have been collected with the assistance of the following firms of the wholesale chemical trade:

Aktiengesellschaft für Anilinfabrikation * Berlin. 434

Badische Anilin- und Sodafabrik * Ludwigshafen a. Rh. 435

Leopold Cassella & Co. * Frankfurt a. M. 436

Chemische Fabriken vorm. Weiler-ter-Meer * Uerdingen a. Rh. 437

Farbenfabriken vorm. Friedr. Bayer & Co. Akt.-Ges. * Elberfeld. 438

Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M. 439

Kalle & Co. * Biebrich a. Rh. 440

Oehler, Anilin- und Anilinfarbenfabrik * Offenbach a. M. 441

f) Prolonged experiments at high temperatures.

E. A. Lentz * Berlin N., Gr. Hamburger Str. 2 * Shaking and vacuum apparatuses. 442

Prof. Dr. Siegfried * Leipzig, Universität * Shaking apparatus. 443

444 Prof. Dr. Thoms * Dahlem bei Berlin, Universität * Drying cupboard; oven for sealed tubes with shaking arrangement.

445 Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H. * Berlin N., Chausseestrasse 3 * Oven with shaking apparatus; steam baths for sealed tube ovens, &c.

g) Physiological and fermentative chemistry.

Preparations.

446 Prof. Dr. E. Buchner * High School of Agriculture, Berlin * Zymase preparations.

447 Dr. Diels, Privatdozent * Berlin, Universität * Crystalline acid from cholesterine.

448 Prof. Dr. O. Emmerling * Berlin, Universität * Bacillus Boocopricus; synthetical Amygdaline.

449 Prof. Dr. E. Fischer, Geh. Reg.-Rat * Berlin, Universität * Sugar group; decomposition of albumen; synthesis of the polypeptides.

450 Prof. Dr. König, Geh. Reg.-Rat * Münster i. W., Universität * Preparations of cellulose.

451 Prof. Dr. William Küster * Veterinary College, Stuttgart * Crystalline oxyhaemoglobine; decomposition of haemine.

452 Dr. Kutscher, Privatdozent * Marburg, Universität * Auto-digestion of yeast; extract of meat.

453 Prof. Dr. Alexander Mitscherlich * Freiburg i. B., Universität * Historical preparations of sulfite-cellulose.

454 Dr. C. Neuberg, Privatdozent * Berlin, Universität * Sugars derived from urine; products of metabolism.

455 Prof. Dr. Ost * Technical College, Hanover * Preparations for technological instruction; Tobacco and cellulose.

456 Prof. Dr. Reinke * Technical College, Braunschweig * Crude arabane; examination of yeast.

457 Prof. Dr. Ruff * Berlin, Universität * Decomposition of glucose.

458 Prof. Dr. Salkowski * Berlin, Universität * Taurocarbamic acid; Kynuric acid, &c.

459 Prof. Dr. Siegfried * Leipzig, Universität * Pepsinefibrinepeptone; Tryponic fibrine-peptone.

460 Prof. Dr. Thierfelder * Berlin, Universität * Glycuronic acid lactone.

461 Prof. Dr. Tollens, Geh. Reg.-Rat * Chemical Institute of Agriculture, University of Göttingen * Sugar group.

462 Prof. Dr. Vongerichten * Jena, Universität * Glucosides; apiine.

463 Dr. E. Wedekind, Privatdozent * Tübingen, Universität * Formanepreparations.

464 Prof. Dr. Wohl * Berlin, Universität * Decomposition of glucose; glycerine aldehyde; inverted sugar.

465 Prof. Dr. Wolffenstein * Charlottenburg * Hydrated cellulose.

Technical preparations of the wholesale chemical trade

such as serums, medicaments, preparations of caseine and albumen, ambrol, lanoline, gelatine, ichthyol, soluble starch, &c.

466 A.-G. für Anilinfabrikation * Berlin.

467 A.-G. für chemische Produkte vormals H. Scheidemandel * Landshut.

468 C. F. Boehringer & Söhne * Waldhof bei Mannheim.

469 Chemische Fabrik Gernsheim-Heubruch * Mannheim.

470 Chemische Fabrik Dr. Eugen Schaal * Feuerbach.

471 Farbenfabriken vormals Friedr. Bayer & Co. Akt.-Ges. * Elberfeld.

472 Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M.

473 Heidelberger Gelatinefabriken Stoess & Co. * Ziegelhausen-Heidelberg.

474 Ichthyolgesellschaft Cordes Hermanni & Co. * Hamburg. See advertisementsp. 24.

475 Kalle & Co. * Biebrich a. Rh.

476 Knoll & Co. * Ludwigshafen a. Rh.

477 Dr. L. C. Marquart * Beuel a. Rh.

478 E. Merck * Darmstadt.

479 Sachsse & Co. * Leipzig.

480 Vereinigte chemische Werke * Charlottenburg.

Apparatuses.

481 Dr. Beck, Privatdozent * Leipzig, Universität * Apparatus for determining the internal friction of living blood.

482 Prof. Dr. E. Beckmann, Geh. Hofrat * Leipzig, Universität * Apparatus for determining the internal friction of living blood.

483 Prof. Dr. E. Buchner * College of Agriculture, Berlin * Hydraulic press and mortar for yeast-cell juice.

484 Prof. Dr. König, Geh. Reg.-Rat * Münster, Universität * Apparatus for the determination of cellulose, colorimeter, &c.

485 Prof. Dr. Lindner * Institute for the Technology of Fermentation, Berlin * Table for microscope work; atlas of yeast; models; alcohol preparations.

486 G. Luther, Maschinenfabrik, A.-G. * Braunschweig * Laboratory mill.

487 F. W. Pest, Maschinenfabrik * Berlin N., Bergstr. 8 * Apparatus for growing pure yeast.

488 Prof. Dr. Reinke * Technical College, Braunschweig * Various analytical apparatuses for starch, &c., apparatus for germination.

489 E. Schmidt & Haensch * Berlin S. 42, Prinzessinnenstr. 16 * Polarising apparatus; colorimeters.

490 Prof. Dr. Tollens, Geh. Reg.-Rat * Göttingen, Universität * Apparatuses for the determination of pentosanes.

491 Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H. * Berlin N., Chausseestrasse 3 * Apparatuses for the determination of nitrogen.

492 Prof. Dr. K. Windisch * Geisenheim a. Rh. * Apparatuses for analysing wine.

493 Prof. Dr. Hans Wislicenus * Tharandt i. S. * Apparatuses for the determination of the ash of plants.

494 Carl Zeiss, Optisches Institut * Jena * Spectrometer for butter analysis; microscope.

X. Scientific instruments. (Mechanics and optics).

(See grp. 19 p. 412.)

495 Aeronautisches Observatorium des Kgl. Meteorol. Instituts zu Berlin * Berlin-Reinickendorf-West.

496 C. Bamberg * Friedenau (Berlin), Kaiserallee 87/88.

497 Georg Bartels * Göttingen.

498 Max Bekel * Hamburg-Barmbeck, Elsassstr. 39.

499 Hugo Bieling * Steglitz (Berlin), Florastrasse 2.

500 J. & A. Bosch * Strassburg i. E., Münstergasse 15.

501 R. Brunnée * Göttingen, Untere Waschstrasse 26.

502 Paul Bunge * Hamburg, Ottostr. 13.

503 Reinhold Burger * Berlin N., Chausseestrasse 2 e.

504 Arthur Burkhardt * Glashütte i. S.

505 Continental Caoutchouc & Gutta-Percha Co. * Hannover.

Dreyer, Rosenkranz & Droop * Hannover. 506
See advertisements p. 10.

Fechner, Institutsmechaniker des Kgl. Geodät. Instituts * Potsdam. 507

R. Fuess * Steglitz (Berlin), Düntherstrasse 7/8. 508

F. O. R. Goetze * Leipzig, Härtelstr. 4. 509

Ephraim Greiner * Stützerbach i. Th. 510

Günther & Tegetmeyer * Braunschweig, Höfenstr. 12. 511

E. Gundelach * Gehlberg i. Th. 512

Bernhard Halle * Steglitz (Berlin), Hubertusstr. 11. 513

Hartmann & Braun, A.-G. * Frankfurt a. M.-Bockenheim. 514

A. Hasemann * Berlin C., Nikolaikirchstrasse 7. 515

H. Hauswaldt * Magdeburg, Neue Neustadt. 516

H. Heele * Berlin O., Grüner Weg 104. 517

W. C. Heraeus * Hanau. 518

H. Hommel * Mainz. 519

Junkers & Co. * Dessau. 520

Max Kohl * Chemnitz, Adorfer Str. 20. 521

A. Krüss * Hamburg, Adolfsbrücke 7. 522

E. Leitz * Wetzlar a. L. 523

Leppin & Masche * Berlin SO., Engelufer 17. 524

Friedrich Lux * Ludwigshafen. 525

A. Mensing, Kapitän z. S. a. D. * Berlin W., Kurfürstenstr. 99. 526

Prof. Dr. A. Miethe * Charlottenburg. 527

J. D. Möller * Wedel i. Holst. 528

Richard Müller-Uri * Braunschweig. Schleinitzstr. 19. 529

W. Niehls * Berlin N., Schönhauser Allee 171. 530

Normal-Eichungs-Kommission * Charlottenburg. 531

Julius Peters * Berlin NW., Turmstr. 4. 532

Physikalisch-Technische Reichsanstalt * Charlottenburg. 533

C. Richter * Berlin N., Johannisstr. 14/15. 534

A. Riedinger * Augsburg. 535

Clemens Riefler * München, Karlsplatz 29. 536

Th. Rosenberg * Berlin N., Chausseestrasse 95. 537

Schäffer & Budenberg * Magdeburg-Buckau. 538

E. Schmidt & Haensch * Berlin S., Prinzessinnenstr. 16. 539

540 G. Schoenner, Reisszeugfabrik * Nürnberg.

541 Louis Schopper * Leipzig, Arndtstr. 27.

542 Schott und Genossen, Glaswerk * Jena.

543 G. A. Schultze * Berlin SW., Schöneberger Str. 4.

544 Dr. Siebert & Kühn * Kassel.

545 Siemens & Halske, Aktiengesellschaft * Berlin SW., Markgrafenstr. 94.

546 Sommer & Runge * Berlin W., Wilhelmstrasse 122.

547 W. Spoerhase * Giessen, Steinstr. 37.

548 P. Stückrath * Friedenau (Berlin), Albestrasse 11.

549 L. Tesdorpf * Stuttgart, Forststr. 71.

550 Otto Töpfer & Sohn * Potsdam, Mammonstr. 3.

551 J. Wanschaff * Berlin S., Elisabethufer 1. See advertisements p. 26.

552 Prof. Dr. Max Wolf * Heidelberg.

553 Otto Wolf * Berlin W., Karlsbad 15.

554 Carl Zeiss, Optische Werkstätte * Jena.

XI. Biology.

a) Zoology.

555 Provinzialmuseum zu Altona (Direktor: Dr. Lehmann) * Biological groups of mamals and birds; photographs and preparations.

556 Kgl. Museum für Naturkunde zu Berlin (Direktor: Geh. Reg.-Rat Prof. Dr. Möbius) * Biological preparations of animals dried or in spirits.

557 Institut für Meereskunde an der Universität Berlin (Direktor Geh. Reg.-Rat Prof. Dr. Freiherr von Richthofen) * Zoological preparations in spirits.

558 Zoologisches Institut der Universität Berlin (Direktor: Geh. Reg.-Rat Prof. Dr. Schulze) * Anatomical preparations.

559 Naturhistorisches Museum Bremen (Direktor: Prof. Dr. Schauinsland) * Preparations, dried or in spirits.

560 Grossherzogliches Museum in Darmstadt (Direktor der Zoologischen Abteilung: Prof. von Koch) * Stuffed gazelle on natural peat ground; anatomical dried preparations, and models in gypsum.

561 Naturhistorisches Museum Hamburg (Direktor: Prof. Kraepelin) * Systematic anatomical or biological preparations.

562 Zoologisches Institut der Universität Heidelberg (Direktor: Geh. Reg.-Rat Bütschli) * Anatomical preparations of animals in spirits.

563 Nordseemuseum Helgoland (Direktor: Prof. Heincke) * Preparations illustrating the biology of the useful fauna of the North sea.

564 Zoologisches Institut der Universität Leipzig (Direktor: Prof. Chun) * Anatomical and biological preparations; collection of especially interesting deep sea animals of the Valdivia expedition.

565 Zoologisches Institut der Tierärztlichen Hochschule München (Direktor: Prof. Dr. Hofer) * Preparations in spirits of diseases of fish.

566 Kgl. Naturalienkabinett Stuttgart (Direktor: Prof. Lampert) * Stuffed mamals and birds; biological preparations of insects.

567 Zoologisches Institut der Universität Würzburg (Direktor: Prof. Boveri) * Zoological models and preparations.

568 Paul Osterloh, Kunstanstalt für anatomische und zoologische Modelle * Leipzig-Gautzsch * Founded 1879. Zoological models.

569 Werner & Winter * Frankfurt a. M. * Illustration of natural history and medical works, separately and in periodicals.

b) Botany.

570 Kgl. Botanischer Garten und Museum zu Berlin (Direktor: Geh. Reg.-Rat Prof. Dr. Engler) * Plans and photographs of the new botanical garden at Dahlem; colonial products, maps, pictures of Togoland, the Cameroons, German South West Africa, East Africa, and German possessions in the South Seas.

XII. Medicine.

a) Teaching methods in anatomy.

571 Anatomische Anstalt der Universität Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Waldeyer) * Anatomical preparations, models and apparatus; anatomical atlas.

572 Anatomische Anstalt der Universität Breslau (Direktor: Geh. Med.-Rat Prof. Dr. Hasse) * Models; photographs; handatlas.

573 Anatomische Anstalt der Universität Erlangen (Direktor: Prof. Dr. J. von Gerlach) * Preparations, models, photograms, photographs.

574 Anatomische Anstalt der Universität Göttingen (Direktor: Geh. Med.-Rat Prof. Dr. Friedr. Merkel) * Models, diapositives.

575 Anatomische Anstalt der Universität Halle a. S. (Direktor: Prof. Dr. W. Roux) * Models, educational appliances.

576 Anatomische Anstalt der Universität Heidelberg (Direktor: Prof. Dr. M. Fürbringer) * Preparations, educational appliances.

577 Anatomische Anstalt der Universität Jena (Direktor: Prof. Dr. F. Maurer) * Preparations, drawings.

578 Anatomische Anstalt der Universität Königsberg i. Pr. (Direktor: Prof. Dr. Stieda) * Anatomical preparations.

579 Anatomische Anstalt der Universität Leipzig (Direktor: Prof. Dr. W. His) * Manual, School atlas.

580 Anatomische Anstalt der Universität München (Direktor: Prof. Dr. J. Rückert) * Model of a skull.

581 Anatomische Anstalt der Universität Strassburg i. E. (Direktor: Prof. Dr. G. Schwalbe) * Preparations.

582 Anatomische Anstalt der Universität Würzburg (Direktor: Prof. Dr. Ph. Stöhr) * Atlas, tables, educational appliances.

583 J. Steger * Leipzig * Anatomical models, preparations.

584 Friedrich Ziegler * Freiburg i. B. * Manufacturer and publisher of plastic educational appliances for anatomy, embryology and zoology, &c. Established 1852.

b) Educational science in pathological anatomy.

585 Pathologisches Institut der Universität Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Orth) and Dr. Kaiserling the 1st assistant at the same institution * Pathological-anatomical preparations, moulages, framed photographs, plans, educational appliances.

586 Klinik für Hals- und Nasenkrankheiten in Berlin (Direktor: Geh. Med.-Rat Prof. Dr. B. Fränkel) * Pathological-anatomical preparations, moulages and illustrations.

587 Klinik für Haut- und Geschlechtskrankheiten in Berlin (Direktor: Prof. Dr. Lesser) * Framed tables, photographs, drawings.

588 Klinik für Augenkrankheiten in der Charité zu Berlin (Direktor: Prof. Dr. Greeff) * Pathological-anatomical preparations.

589 Pathologisches Institut der Universität Breslau (Direktor: Geh. Med.-Rat Prof. Dr. Ponfick) * Coloured tables.

590 Pathologisches Institut der Universität zu Kiel (Direktor: Prof. Dr. Heller) * Stereoscopic photographs.

591 Pathologisches Institut der Universität zu München (Direktor: Prof. Dr. Bollinger) * Pathological-anatomical preparations.

592 Prof. Dr. Benda * Berlin (Pathological Institute of the Urban Municipal Hospital) * Pathological-anatomical preparations and diapositive.

593 Dr. Paul Berliner, Arzt * Berlin, Lützowstrasse 17 * Institute for plastic anatomy: Anatomical wax preparations covering the whole range of medicine.

594 Prof. Dr. von Hansemann * Berlin (Pathological Institute of the Friedrichshain Hospital) * Pathological-anatomical preparations.

595 Fritz Kolbow, Bildhauer * Berlin, Flemmingstr. 6 * Representation of dissection, modelled in wax after a corpse.

596 Prof. Dr. Langerhans * Berlin (Pathological-anatomical Institute of the Moabit Hospital) * Pathological-anatomical preparations.

597 Dr. Rumpel * Hamburg (Chief doctor at General Hospital). Coloured tables.

598 Prof. Dr. Schmorl * Dresden (Pathological Institute of the Municipal Hospital) * Stereoscopic atlas.

c) Educational science in Surgery.

a. Section under Wirkl. Geh. Rats Prof. Dr. von Bergmann of Berlin.

599 Chirurgische Universitätsklinik Berlin (Direktor: Wirkl. Geh. Rat Prof. Dr. von Bergmann) * Prof. Dr. Lexer, Dr. Bier, Dr. Bockenheimer, Dr. Borchardt, Dr. Frohse, Dr. Unger. Pictures, diapositives, preparations, drawings, models and apparatuses.

600 Dr. W. von Oettingen * Steglitz * Gyps models for treatment of club foot.

601 Schiltsky, Zahnarzt * Berlin, Rosenthaler Str. 70 * Gyps models and tooth prothesis.

602 Deutsche Gesellschaft für Chirurgie * Berlin, Ziegelstr. 11 * 30 engravings (portraits of surgeons).

603 Becker, Mechanische Werkstätte * Göttingen * Microtome.

604 Moritz Böhme * Berlin N. * Specialities: Bandages. Complete fittings for hospitals. Model of a railway ambulance.

605 Drägerwerke * Lübeck * Oxygen-chloroform apparatus.

606 H. Hirschmann * Berlin N., Ziegelstrasse 30 * Röntgen apparatus. Demonstration tables.

607 R. Jung, Inh. W. Löw & L. Jung Ww., Werkstätte für wissenschaftliche Instrumente * Heidelberg, Landhausstr. 12 * Microtome.

608 F. & M. Lautenschläger * Berlin N., Oranienburger Str. 54 * Disinfection apparatus.

609 Louis & H. Loewenstein * Berlin, Ziegelstr. 28 * Cystoscopic instruments according to Prof. Nitze. Demonstration according to Prof. Kutner.

610 Franz Schmidt & Haensch * Berlin S., Prinzessinenstr. 16 * Non reflecting eye mirror according to Dr. Thorner.

611 Siemens & Halske, Akt.-Ges. * Berlin SW., Markgrafenstr. 94 * Demonstration apparatus for Röntgen diapositives. Illumination screens.

612 Percy Simundt * Berlin W., Nürnberger Str. * Surgical instruments.

613 H. Windler * Berlin N. 24, Friedrichstrasse 133 a. * Purveyor to the Court. Manufacturer of: Surgical instruments, bandages, prostheses, orthopædical apparatus, hospital furniture. Awards: London 1862, Paris 1867, Moscow 1872, Berlin 1879, Chicago 1893. Exhibits: Silver plated case with instruments as used in the Royal University Surgery of Berlin.

614 Carl Zeiss, Optisches Institut * Jena * Demonstration microscope. Stereoscopic apparatus.

β. Department of Geh. Med.-Rat Prof. Dr. von Mikulicz-Radecki of Breslau.

615 Chirurgische Klinik der Universität zu Breslau (Direktor: Geh. Med.-Rat Prof. Dr. von Mikulicz-Radecki) * Moulages, Röntgograms, Diapositives, Instruments.

616 Chirurgische Universitätsklinik Bonn (Direktor: Prof. Dr. Bier) * Hot air box, hot air douche, suction apparatus for artificial Hyperæmia and removal of stiffness in joints.

617 Chirurgische Klinik der Universität Kiel (Direktor: Prof. Dr. Helferich) * Tables concerning fractures and luxations.

618 Chirurgische Klinik der Universität zu Königsberg i. Pr. (Direktor: Prof. Dr. Garré) * Coloured tables concerning tumours in the face.

619 Chirurgische Klinik der Universität zu Leipzig (Direktor: Prof. Dr. Trendelenburg) * Photographic illustrations.

620 Universitäts-Poliklinik für orthopädische Chirurgie Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Hoffa) * Orthopædical demonstrations.

621 Universitätsklinik für Hautkrankheiten Breslau (Direktor: Prof. Dr. Neisser) * Stereoscopic photographs, moulages.

622 Dr. Kümmel, 1. chirurgischer Oberarzt des Allgemeinen Krankenhauses Hamburg-Eppendorf * Photographs and Röntgen pictures concerning ailments of the kidneys.—New Cystoscope and apparatus. Photograph of an operation theatre.

623 Georg Haertel * Breslau, nur Albrechtstrasse * Instrument maker to the University surgery.—Wire saws. Over 25,000 instruments and apparatuses in 1903 from von Mikulicz's surgery.—von Mikulicz's œsophagoscopic instruments, rubber stamp for body schematism. Nickeline clamps.

624 A. Kröner * Breslau * Kgl. Hautklinik. Wax models of skin diseases, internal organ and operations.—Patented process specially suited for the characteristic reproduction of skin, bones, scales, internal organs, &c.

625 Ferd. Enke, Verlagsbuchhandlung * Stuttgart * Books.

626 J. F. Lehmanns Verlag * München, Heustrasse 20 * Maps about gynæcology and surgery.

d) Educational Science In internal medicine.

1. Doctors.

627 Dr. de la Camp * Berlin (Kgl. Charité) * Röntgen illustrations of lung tuberculosis.

628 Dr. Cowl * Berlin * Röntgen illustrations of lung tuberculosis.

629 Prof. Dr. A. Fraenkel * Berlin (Krankenhaus Am Urban) * Illustrations concerning the pathology of lung diseases.

630 Prof. Dr. Greeff, Berlin (Kgl. Charité) * Preparations and drawings of eyetuberculosis.

631 Prof. Dr. von Hansemann * Berlin (Krankenhaus am Friedrichshain) * Anatomical preparations concerning phthisis of the lungs.

632 Dr. Immelmann * Berlin * Röntgen illustrations concerning tuberculosis of the lungs.

633 Prof. Dr. Krönig, dirigierender Arzt der inneren Abteilung des Krankenhauses Friedrichshain * Berlin * Demonstration tables concerning percussion of the tips of the lungs.

634 Prof. Dr. Langerhans * Berlin (Moabit Hospital) * Anatomical preparations.

635 Prof. Dr. Lassar * Berlin * Moulages concerning tuberculosis of the skin.

636 Prof. Dr. Lesser * Berlin (Kgl. Charité) * Photographs of patients treated according to Finsen.

637 Dr. Levy-Dorn * Berlin * Röntgen illustrations of tuberculosis of the lungs.

638 Prof. Dr. Möller * Belzig (Consumptive sanatorium) * Pure cultures, photographs curves concerning tuberculine reaction, model of cross packing.

639 Dr. Niedner, Stabsarzt * Berlin (Kgl. Charité) * Illustrations of a compression bandage.

640 Selfert, Präparator * Berlin (Anatomical institute) * Model of the section of a head.

2. Firms:

641 

W. Biel, Holzindustrie * Itzehoe bei Hamburg * Speciality: Stumpf's Reform Slide window. German patent 128,824; introduced into Germany with increasing success since 1902; absolutely tight, non-vibrating and non-fouling. The U. S. patent 676,159 is to be disposed of.

642 Börner & Hertzberg * Berlin * Illustrations concerning Hydrotherapy.

643 Meierei C. Bolle * Berlin NW. 21 * Inhaber Kgl. Kommerzienrat C. Bolle und Dr. med. C. Bolle. Founded 1881. Provision of Berlin with milk free from hygienic objections, daily quantity 120,000 litres; 225 milk sale waggons; 350 horses, 1,700 officials and employees, own dairies, tuberculine vaccination, immunisation according to Prof. Behring; Orchards Marienhain-Köpenick. Album with 11 photographs representing "The combating of tuberculosis in the arrangements of C. Bolle's dairy-farm."

644 G. Bruck * Berlin * Electro-laryngoskopic pocket case of instruments.

645 Chemische Fabrik auf Aktien (vorm. E. Schering) * Berlin * Articles for disinfecting.

646 Christoph & Unmack, Akt.-Ges. * Niesky (Oberlausitz) * Model of a transportable pavilion for sick people; to be taken apart.

647 Detert * Berlin * "Durit" ice bags.

649 W. Dittmar * Berlin, Molkenmarkt 6 * Adjustable bed, comfortable and springy when in a flat position owing to the springiness being independent, i. e., a pressure exerted only effects the place pressed. This is a new feature possessed by no other mattress and which is an extraordinary improvement on the metal mattress as the mattress can perfectly accomodate itself to the resilient parts of the body.

650 Dustless, Ges. m. beschr. Haftung * Berlin * Dustless-Oil.

651 Elektromotor, Ges. m. beschr. Haftung * Berlin * Fittings for hospitals.

652 Dr. Graf & Co. * Berlin * Disinfecting varnishes and distemper colours.

653 Gebr. Körting, Aktiengesellschaft * Körtingsdorf bei Hannover * Ray apparatuses, central heating, combustion motors.

654 Paul Kreitling * Berlin W. 50 * Automatic Acetylene gas developer for 1 to 2 burners. Projects and installations for works of all sizes.

655 F. & W. Lautenschläger * Berlin * Fittings for laboratories.

656 Ernst Leitz * Wetzlar * Microscopes and apparatuses.

657 Ernst Lentz * Berlin NW., Birkenstr. 18 * Manufactory of hospital fittings, instrument cupboards, operation tables and articles required in consumption sanatoriums.

658 Lysoform, G. m. b. H. * Berlin * German Patent Nos. 141,744 and 145,380. American patent No. 740,424. Formaldehyd preparation, antiseptic and disinfection medium; free from the dangerous secondary action of carbolic preparations; enables reliable disinfection without bad smells. Exhibited in the German Education Exhibition by order of the Royal Prussian Ministry of Education. Principal firm: Berlin. Daughter companies: Paris, London, St. Petersburg, Milan. See advertisements p. 17.

659 Medizinisches Warenhaus, Akt.-Ges. * Berlin * Models, instruments.

660 H. Pfau (Inhaber C. O. Fiebig) * Berlin * Protecting mask for persons affected with Phthisis.

661 Quantmeyer & Eicke * Berlin * Samples of linoleum.

662 Rietschel & Henneberg * Berlin * Expectoration and fecal sterilisers.

663 Dr. Ernst Silbersteln (Kaiser-Friedrich-Apotheke, Vertreter der Drägerwerke in Lübeck) * Berlin * Model of an oxygen inhaling apparatus.

664 Thermophorgesellschaft * Berlin * Thermophor cushions, Thermophor milk warmer and foot rests.

665 Westphal & Reinhold * Berlin N. 39 * Fabrik von Metallmöbeln und Patentspringfedermatratzen. Established 1889. 400 workmen. Royal Prussian Gold medal 1899. Education group. Original photograph of a bed made of steel tubes which can be taken to pieces, for sanitary service, according to Reinhold's German Patent, free from cracks or bacteria; sides form truss frames preventing the bed posts from yielding. Contractors to the War Office, infirmaries, sanatoriums, &c.

666 Carl Zeiss * Jena * Microscopes.

e) Section for Bacteriology and experimental Therapy (incl. the combating of diseases).

a. Bacteriological and experimental Therapy.

667 Kgl. Institut für Infektionskrankheiten zu Berlin (Direktor: Geh. Med.-Rat Prof. Dr. R. Koch) * Cultures, microphotograms, illustrations, wall tables, preparations, different kinds of serum, poison, &c.

668 Kgl. Anatomisch-Biologisches Institut der Universität Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Hertwig) * Pathological preparation from tuberculosis of a turtle.

669 Kgl. Hygienisches Universitätsinstitut zu Breslau (Direktor: Geh. Med.-Rat Prof. Dr. Flügge) * Apparatus for removing matter for bacteriological investigations—combustible spitoons—glass plates coughed on by persons affected with Phthisis (drop infection).

670 Kgl. Institut für experimentelle Therapie zu Frankfurt a. M. (Direktor: Geh. Med.-Rat Prof. Dr. Ehrlich) * Wall tables, photographs, apparatus for removing matter for bacteriological investigations. Articles for the governmental control of serum.

671 Augenklinik der Grossherzogl. Universität zu Freiburg i. Br. (Direktor: Prof. Dr. Axenfeld) * Wall tables and cultures.

672 Kgl. Hygienisches Universitätsinstitut zu Halle a. S. (Direktor: Geh. Med.-Rat Prof. Dr. C. Fränkel) * Wall tables and apparatus for removing matter for bacteriological investigations.

673 Pathologisches Institut der Kgl. Tierärztlichen Hochschule zu München (Direktor: Prof. Dr. Kitt) * Pathological preparations.

674 Lungenheilstätte zu Belzig (Direktor: Prof. Dr. Möller) * Tables of statistics concerning the action of tuberculin.

675 Prof. Dr. Benda * Berlin * Pathological anatomical preparations.

676 Gustav Fischer, Verlagsbuchhandlung * Jena * Bacteriological text books.

677 Prof. Dr. Lassar * Berlin * Coloured diapositives, representing the transmission of syphilis to chimpanzees.

678 Dr. Plorkowski * Berlin * Coloured wall tables for instruction in bacteriology.

679 Prof. Dr. Sobernheim * Halle a. S. * Bacteriology of anthrax, cultures, preparations, illustrations, photograms, serum, &c.

680 E. & M. Lautenschläger * Berlin * Bacteriological model laboratory. So-called "flying" laboratories for cholera and typhoid. Bacteriological apparatuses. Instrument cases, Instruments, &c.

β. Combating of diseases.

681 Kaiserliches Gesundheitsamt, Berlin * Statistical and graphical representations of the outbreak and spread of infectious diseases and pestilences. Pamphlets about the combating of infectious diseases and pestilences, vaccination, microphotograms, models.

682 Medizinalabteilung des Kgl. Preussischen Kriegsministeriums in Berlin * Graphic representations of the spread of abdominal typhus in European armies.

683 Medizinalabteilung des Kgl. Preussischen Ministeriums der geistlichen-Unterrichts- und Medizinal-Angelegenheiten zu Berlin * Plans of the Lepers home at Memel.

684 Oberregierungsrat Beisswänger, Vorstand des Hygienischen Laboratoriums, Tierärztliche Abteilung (Kgl. Württemb. Medizinalkollegium, Tierärztliche Abteilung) zu Stuttgart * Pamphlets about vaccination, &c. Instruments and sera for vaccination.

685 Prof. Dr. Hermann Dürck * München * Preparations, illustrations and photograms concerning infectious diseases.

686 Dr. Karl Enoch, Serumlaboratorium * Hamburg * Serotherapeutic preparations.

687 Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M. * Serotherapeutic preparations.

688 Prof. Frosch, Leiter des Bakteriologischen Untersuchungsamts in Trier * Graphic representation of the combating of typhus in the West of the German Empire.

689 Rud. A. Hartmann, Maschinenfabrik, Eisen- und Metallgiesserei * Berlin * Apparatus for the destruction of corpses. Drawings.

690 Knappschaftsverein Bochum] * Bochum * Pamphlets concerning vermination.

691 F. & M. Lautenschläger * Berlin * Equipment for a bacteriological laboratory.

692 E. Leitz, Optisch-mechanische Werkstätte * Berlin * Microscopes.

693 Grossherzogl. Hess. Obermedizinalrat Lorenz, Veterinärreferent im Ministerium des Innern * Darmstadt * Pamphlets concerning vaccination, instruments and sera for vaccination, graphic representations about the spread of swine fever.

694 E. Merck, Chemische Fabrik * Darmstadt * Serotherapeutic preparations.

695 Podewils Fabriken, Ges. mit beschr. Haftung * Augsburg * Apparatus for the destruction of corpses. Drawings.

696 Rietschel & Henneberg, Fabrik für gesundheitstechnische Apparate * Berlin * Apparatus for the destruction of corpses. Drawings.

697 M. Schanze, Feinmechaniker * Leipzig * Microtome.

698 M. & H. Scheibert, Optisches Institut * Berlin * Microscopes.

699 Staatliches Hygienisches Institut * Hamburg * Pictures and representations concerning the origin and cure of bronchitis.

700 C. Zeiss, Optisch-mechanische Werkstatt * Berlin * Microscopes.

f) Röntgen Cabinet.

701 Siemens & Halske, A.G. * Berlin SW.12 * Complete Röntgen outfit with induction coils and sparks up to 1 metre long. Compression diaphragm with test table. Apparatuses for Cauterisation, Endoscopy. Electrolytical interrupter.

702 Kgl. Universitätsinstitut für Untersuchungen mit Röntgenstrahlen zu Berlin (Direktor: Prof. Dr. Grunmach) * Illustrations of investigating apparatuses for diagnosis by means of X rays. Diapositives of Actinograms covering the whole range of medicine.

703 Dr. Kümmel (I. Chirurgische Abteilung des Allgemeinen Krankenhauses) in Hamburg-Eppendorf * Stereoscopic Röntgen Atlas. Stereoscopic diapositives.

704 Dr. Albers-Schönberg, Arzt * Hamburg, Klopstockstr. 10 * Transparent pictures.

g) Other exhibits concerning medicinal instruction.

705 Ohrenklinik der Kgl. Charité zu Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Passow) * Models: Operation concerning the ear according to Trautmann. Radical operation according to Passow. Stereoscopic map. Stereoscope.

706 Pharmakologisches Institut der Universität Berlin (Direktor: Geh. Med.-Rat Prof. Dr. Liebreich) * The first curatives physiologically investigated in the Pharmacological Institute.

707 Neurobiologisches Universitätslaboratorium Berlin * Maps of brain anatomical methods. Wall tables and diapositives about the anatomy of the brain.

708 Universitätsaugenklinik Breslau (Direktor: Geh. Med.-Rat Prof. Dr. W. Uhthoff) * Stereoscopic-medical atlas of ophthalmology; stereoscopic diapositive; Petzold's red green diapositive with red green spectacles; model of a Heyne's projection apparatus.

709 Psychiatrische und Nervenklinik der Universität Kiel (Direktor: Prof. Dr. Siemerling) * Preparations (brain sections).

710 Psychiatrische Klinik Giessen (Direktor: Prof. Dr. Sommer) * Plans and sketches of small institutions for the treatment of physical disturbances; instructional text books of psychiatry.

711 Orthopädisch-Chirurgische Klinik von Dr. Fopp und Dr. Eckstein * Berlin W., Steglitzer Str. 10 * Photographs of results of paraffin-prothesis; injection syringe.

712 Dr. Hermann Gutzmann * Berlin W., Schöneberger Ufer 11 * Apparatus for demonstration of the movements of the soft palate in speaking.

713 Dr. Walter Thorner, Physician * Berlin, Wilhelmstr. 118 * Diapositive of photographs of the back of the living eye.

714 E. L. Fischer, Fabrik für chirurgische Instrumente, Operationsmobilien und Krankenhausbedarf * Freiburg i. B. * Models and manikins.

715 Paula Guenther * Berlin W., Bülowstrasse 20 * Medical tables and drawings.

716 Fritz Kolbow, Sculptor * Berlin, Flemmingstr. 6 * Forty-five wax and plaster models of original preparations, cast and coloured from nature; silver medal of the Royal Ministry of Public Instruction of Prussia.

717 Louis & H. Loewenstein * Berlin N. * Manufacture of surgical instruments and electric medical appliances, established 1872. Exports to all civilized countries. Special department for reconstruction, connected with internal lighting of the body, and delicate machinery. Two Royal Prussian State Medals in silver among many other distinctions. Latest award gold medal from the World's Fair in Paris in 1900.

718 Messters Projektion, G. m. b. H. * Berlin SW. * Special house for construction of the Messter Kinematograph; machine for kinematographic projection (German patent 127,913) with protecting apparatus in case of fire (German patent 126,353); Messter's kinematographic camera for serial photography (German patents 127,913 and 127,543—American patent 698,125); examples taken of interesting nerve-cases.

719 E. Ad. Müller Söhne * Wiesbaden * Artificial eyes as protheses and educational appliances; established in 1860; fifteen assistants; ten distinctions conferred, one bronze, seven gold, and two large medals.

720 Privatdozent Dr. Ludwig Neumayer * München * Model of a skull.

721 M. Petzold, Spezialgeschäft für Photographie * Chemnitz, Langestr. 23 * Diapositive for projection with stereoscopic effect; own patent.

722 Carl Zeiss, Optische Werkstätte * Jena * Microscope with apparatuses for projection and microphotography.

Exhibition of elementary and secondary education.

XIII. High Schools ("Gymnasiums" and "Realschools" including Cadet Academies).

723 Kgl. Joachimsthalsches Gymnasium zu Berlin W. (Alumnat).

724 Kgl. Landesschule zu Pforta (Alumnat).

725 Kgl. Auguste-Viktoria-Gymnasium zu Posen.

726 Kgl. Gymnasium zu Wongrowitz.

727 Städtisches Goethe-Gymnasium zu Frankfurt a. M. (Reformsystem).

728 Städtisches Realgymnasium zu Elberfeld.

729 Städtisches Realgymnasium zu Barmen (Reformsystem).

730 Städtisches Realgymnasium "Musterschule" zu Frankfurt a. M. (Reformsystem).

731 Städtische Oberrealschule zu Bochum.

732 Evangelisches Pädagogium zu Godesberg a. Rh. (Realschule und Progymnasium—Privatanstalt, Alumnat).

733 Städtische II. Realschule zu Berlin N., Weissenburger Str. 4 a.

734 Städtische Realschule zu Kreuznach.

735 Kgl. Kadettenanstalten (Lehrplan des Realgymnasiums).

736 Deutsche Auslandsschulen zu Antwerpen, Brüssel, Bukarest und Konstantinopel.

The exhibits of these establishments comprise pictures, photographs, sketches and plans of the school buildings, descriptions of the rooms with pictures of the life at the schools and of scholars, specifications of the teaching system and the various methods of organisation of the staff, time-tables, arrangement of instruction, domestic and household matters, and details of inspection by government authorities, attendance, and choice of professions, together with specimens of work done, exercise books, examination papers, methods of examination and qualifications.

XIV. Elementary schools, board-schools, intermediate schools, high-schools for girls, teachers' training schools, and schools for children with defective senses.

737 232. Knabengemeindeschule zu Berlin SO., Glogauer Str. 13–16.

738 213. Mädchengemeindeschule zu Berlin NO., Christburger Str. 18.

739 Dorfschule (einklassige Volksschule) zu Datum-Nienhöfen, Kreis Pinneberg (Provinz Schleswig-Holstein).

740 Knabenmittelschule (Arndt-Schule) zu Stettin.

741 Erste Mädchenmittelschule zu Stettin.

742 Kgl. Augusta-Schule mit Kgl. Lehrerinnenseminar zu Berlin SW., Kleinbeerenstr. 16–19.

743 Städtische Sophien-Schule (Höhere Mädchenschule mit Gymnasialkursen für die weibliche Jugend) zu Hannover.

744 Kgl. Schullehrerseminar zu Ziegenhals.

745 Kgl. Lehrerinnenseminar zu Burgsteinfurt i. W.

746 Kgl. Blindenanstalt zu Steglitz (Berlin).

747 Städtische Taubstummenerziehungsanstalt zu Frankfurt a. M.

748 Städtische Idiotenanstalt Berlin-Dalldorf.

The exhibits of the above establishments include pictures, photographs, sketches and plans of the school buildings, descriptions of the rooms with pictures of the life of the school and scholars, specifications of the teaching system and the various methods of organisation of the staff, time-tables, arrangement of instruction, domestic and household matters, particulars of government inspection, together with specimens of the work done, exercise-books, examination papers, methods of examination and qualifications, as also results of training in handicrafts, and work done by the blind.

XV. Schools exhibit of German Towns.

(See grp. 141 p. 502.)

The following municipalities are exhibitors:

Barmen. 749
Berlin. 750
Bielefeld. 751
Bochum. 752
Breslau. 753
Charlottenburg. 754
Chemnitz. 755
Darmstadt. 756
Dresden. 757
Düsseldorf. 758
Eisleben. 759
Elberfeld. 760
Frankfurt a. M. 761
Hamburg. 762
Hannover. 763
Hildesheim. 764
Hörde. 765
Kassel. 766
Königsberg i. Pr. 767
Kreuznach. 768
Leipzig. 769
Mainz. 770
München. 771
Nürnberg. 772
Posen. 773
Quedlinburg. 774
Stettin. 775
Stolp (Pommern). 776
Strassburg i. E. 777
Stuttgart. 778

The exhibits of the above towns comprise models and pictures of school buildings, gymnasiums, school gardens, play grounds, plans of sites, sketches, plans, and photographs, as also official reports, festival programmes, school work, examples of skill in handicraft and industrial training, and pictorial descriptions of schools preparing for special professions, school workshops and museums.

XVI. School books, pedagogical treatises, literature of the history of education, and school organisation.

779 **Amthorsche Verlagsbuchhandlung** * Leipzig * Speciality: naturally colored wallpictures for instruction in natural history; popular works on natural history.

780 **Aschendorffsche Buchhandlung** * Münster, Westphalia * Established 1763. Publishers of the "Münster Anzeiger" and "Volkszeitung" now in their fifty-first year (circulation 30,000), of the "Theological Review" in its third, and "Natur und Offenbarung" in its fiftieth year. Speciality: school editions of German and foreign classics.

781 **A. Asher & Co., Verlagsbuchhandlung** * Berlin W., Unter den Linden 13.

782 **C. H. Becksche Verlagsbuchhandlung, Oskar Beck** * München, Wilhelmstr. 9.

783 **Chr. Belserscheverlagshandlung** * Stuttgart, Augustenstr. 13.

784 **Hermann Böhlaus Nachf., Inh.: Gerhard Dommering u. Albert Hartung** * Weimar, Kleine Teichgasse 6.

785 **Gebrüder Bornträger, Verlagsbuchhandlung** * Berlin SW. 11, Dessauer Str. 29.

786 **Friedrich Brandstetter** * Leipzig, Stephanstr. 20.

787 **J. G. Cotta'sche Buchhandlung Nachfolger G. m. b. H.** * Branch establishment Berlin SW. 12, Kochstr. 53, in connection with the "Bessersche Buchhandlung" of W. Hertz.

788 **Deutsche Dichter-Gedächtnis-Stiftung** * Hamburg-Grossborstel, Violastr. 16.

789 **Moritz Diesterweg, Verlagsbuchhandlung** * Frankfurt a. M. * Founded 1860. Bangert's phonetical spelling book, seventh and eighth editions, with two editions of notes. Also Schäfer and Krebs biblical reading book, third and sixth editions.

790 **Dürrsche Buchhandlung** * Leipzig * Founded 1755. (Ed. Peters publishing business acquired in 1903). Principal publications are literature for the "Seminar," school books for "Volksschulen," and instruction books for "Realschulen." Philosophy and theology. The publications exhibited represent very fairly the main object of the business, which is to further the education of German school teachers.

791 **Friedrich Ebbecke, Verlag** * Lissa i. P., Markt 25.

792 **H. G. Elwertsche Verlagsbuchhandlung (W. Braun)** * Marburg (Hessen) * Founded 1783. Modern languages. Scientific literature. Hassiaca. G. Könnecke's pictorial atlas of the history of German literature, second edition, with 2,200 illustrations and fourteen artistic plates. A. F. C. Vilmar's history of German national literature, twenty-fifth (jubilee) edition of about 130,000 copies.

793 **Gustav Fischer, Verlagsbuchhandlung** * Jena, Selliner Str. 8.

794 **Buchhandlung Gustav Fock, G. m. b. H.** * Leipzig, Schlossgasse 7.

795 **Förster & Borries** * Zwickau i. Sachsen * Publishers and art-printers, founded 1881. 115 workmen. Specialities: industrial artistic printing in three colours, posters, paper money, cards of congratulation, schedules, diplomas, &c.; awards: Chicago 1893, State medal Dresden 1896, Leipzig 1897, and gold medal Paris 1900. One copy of Michael's work on Fungi, in two volumes.

796 **G. Freytag, Verlagsbuchhandlung** * Leipzig, Brüderstr. 23.

797 **B. W. Gebel, Verlag, Inh.: Bruno Gebel** * Gross-Lichterfelde, Sternstr. 49.

798 **Hermann Gesenius, Verlagsbuchhandlung** * Halle a. S. * Founded 1861 at Bremen. Chief publication Dr. F. W. Gesenius' text book of the English language, and Professor Regel's arrangement of same. The first edition of this work appeared in 1864, since when 535,000 copies of various editions have been sold.

799 **G. J. Göschensche Verlagsbuchhandlung** * Leipzig, Salomonstr. 10.

800 **Lucas Gräfe & Sillem** * Hamburg, Kaiser-Wilhelm-Str. 82.

801 **F. G. L. Gressler, Schulbuchhandlung** * Langensalza.

802 **G. Grote'sche Verlagsbuchhandlung** * Berlin SW. 11, Dessauer Str. 18.

803 **J. Guttentag, Verlagsbuchhandlung** * Berlin W. 35, Lützowstr. 107/108.

804 **Friedr. Aug. Herbig** * Berlin W. * Verlagsbuchhandlung. Founded 1821. Instruction books for modern languages.

805 **R. Herrosé's Verlag** * Wittenberg * Central publishing office of the combined movement of secondary schools. Founded 1858. Awards at four exhibitions.

806 **Max Hesses Verlag** * Leipzig, Erlenburger Str. 4.

807 **Hermann Hillger, Verlag** * Berlin W., Königgrätzer Str. 7.

808 Ferdinand Hirt, Kgl. Universitäts- und Verlagsbuchhandlung * Breslau VI, Königsplatz 1.

809 Verlagsbuchhandlung A. W. Kafemann * Danzig, Ketterhager Gasse 4.

810 J. M. Kerns Verlag (Max Müller) * Breslau * Krause-Nerger's German grammar for foreigners; large edition, and edition for schools.

811 K. F. Koehler, Verlagsbuchhandlung * Leipzig, Täubchenweg 21.

812 Gerhard Kühtmann, Verlagsbuchhandlung * Dresden * Founded 1887. Educational and instructional publications.

813 Prof. Dr. Hermann Landois * Münster i. W., Tuckesburg, Zoologischer Garten.

814 Langenscheidtsche Verlagsbuchhandlung (Prof. G. Langenscheidt) * Berlin SW. 11, Hallesche Str. 17.

815 F. Leineweber, Verlagsbuchhandlung * Leipzig, Könneritzstr. 57.

816 C. C. Meinhold & Söhne, Kgl. Hofbuchdruckerei und Lehrmittelverlag * Dresden, Zinzendorfstr. 29.

817 Carl Meyer (Gustav Prior), Verlagsbuchhandlung * Hannover.

818 E. S. Mittler & Sohn, Kgl. Hofbuchhandlung * Berlin SW. 12, Kochstr. 68—71.

819 Erwin Nägele, Naturwissenschaftlicher Verlag * Stuttgart * Schmeil's text-books of botany and zoology, and demonstration tables for botanical and zoological instruction. Hoffmann's illustrated botanical atlas, Hoffmann's flora of the Alps, and Wagner's flora with illustrations. Tables from Schmeil's text-book of botany.

820 August Neumanns Verlag, Fr. Lucas * Leipzig, Querstr. 16.

821 L. Oehmigkes Verlag, R. Appelius * Berlin NW. 7, Dorotheenstr. 38/39.

822 Berthold Otto * Gross-Lichterfelde, Holbeinstr. 25 * Publisher of the children's paper "Der Hauslehrer."

823 Hermann Paetel, Verlag * Berlin W., Elssholzstr. 12.

824 A. Pichler's Witwe & Sohn, Verlagsbuchhandlung * Wien und Leipzig.

825 Preuss & Jünger, Buchhandlung * Breslau * Calendar of the system of secondary education obtaining in Prussia and several towns in other parts of Germany. Current edition for 1903.

826 Priebatschs Buchhandlung, Lehrmittelinstitut * Breslau * Teaching appliances for German schools, three volumes. Practical information, advice and opinions. Professor Cohn's table for testing condition and sharpness of eyesight.

827 Rengersche Buchhandlung, Gebhardt & Wilisch * Leipzig * Verlagsbuchhandlung. Founded 1680. Edition of modern languages for reading. Text-books and primers for advanced schools. Scientific cyclopædia.

828 Rossbergsche Verlagsbuchhandlung * Leipzig * Bierbaum's French and English "reform" text-books. Reform library of modern languages. (Collection of school editions with notes and text in the same language.)

829 Emil Roth, Verlagsbuchhandlung * Pedagogic publications. Text-books and exercises in language teaching, German, French, English, Italian, Dutch, and Spanish. Reading-books. Pictures of the Holy Land. Wall-maps.

830 Dr. Theodor Scheffer, Verlagsbuchhandlung * Leipzig, Nostitzstrasse 19.

831 Moritz Schnetter, Verlagsbuchhandlung * Berlin W. 57, Steinmetzstr. 36 * Publishing office of "Der Hauslehrer."

832 J. F. Schreibers Lehrmittel- und Verlagsbuchhandlung * Esslingen bei Stuttgart, und München.

833 Schulhaus-Verlag * Berlin-Tempelhof * "Das Schulhaus," periodical edited by Karl Vanselow.

834 Karl Siegismund, Verlagsbuchhandlung * Berlin SW. 11, Dessauer Str. 13.

835 Franz Siemenroth * Berlin W., Dennewitzstr. 2.

836 Otto Spamer, Verlagsbuchhandlung * Leipzig, Breitkopfstr. 7.

837 Gerhard Stalling, Verlag * Oldenburg i. Gr.

838 Elwin Staude * Berlin W. 35 * Literature dealing with the education of the deaf and dumb, stammering and its cure, and other books of instruction on the same subject. Also a childrens' paper, "Deutsche Jugendpost."

839 Strassburger Druckerei und Verlagsanstalt, vorm. R. Schultz & Co. * Strassburg i. E.

840 Franz Vahlen, Verlagsbuchhandlung * Berlin W. * David Müller, publisher, History of the German People.

841 L. v. Vangerow * Bremerhaven * Publisher of Kleyer's Encyclopædia of the mathematical, technical and exact natural sciences. Various awards.

842 Velhagen & Klasing, Verlagsbuchhandlung * Bielefeld und Leipzig.

843 Friedr. Vieweg & Sohn, Verlagsbuchhandlung * Braunschweig, vor der Burg 18.

844 R. Voigtländers Verlag * Leipzig * Pedagogics, Art. Specially to be mentioned R. Voigtländer's coloured stone drawings (Gold medal, St. Petersburg 1904).

845 Leopold Voss * Hamburg, Hohe Bleichen 34.

846 Buchhandlung des Waisenhauses in Halle a. S. * Established 1698. Works concerning pedagogics: Education and instruction, legislation for schools, school books, object pictures.

847 Weidmannsche Buchhandlung * Berlin * Magazines, text books and manuals for all branches of education at High Schools. Publications about gymnastics, &c.

848 George Westermann * Braunschweig * Established 1838. Publishing and printing office, cartographic institute. Publisher of school atlases, wall maps, school books and dictionaries, and of Westermann's "Illustrierten Deutschen Monatsheften."

849 Wiegandt & Grieben * Berlin SW., Luckenwalder Str. 1.

850 Winckelmann & Söhne * Berlin S. * Established 1828. Publishing bookseller. Educational appliances and school books.

851 Hellmuth Wollermann, Verlagsbuchhandlung * Braunschweig, Bohlweg 13 * Speciality: Evangelical Theology and Pedagogics. Harms's school wall maps and planispheres.

852 Max Woywod, Verlagsbuchhandlung * Breslau VIII, Klosterstr. 3.

853 Ernst Wunderlich, Verlag * Leipzig, Johannisgasse 11.

XVII. Geographical educational appliances (Atlases, maps, globes, relief maps).

854 J. Dinges, Kgl. Seminarlehrer * Mindelheim (Bayern) * Publisher. Geographical relief maps for school and general educational purposes. (Orders undertaken for relief work.) 13 sections of the northern calcareous Alps, relief of the entire Alps, relief of Europe with natural curvatures in earth. Relief of a typical Bavarian highland.

855 G. Freytag & Berndt * Wien, Schottenfeldgasse * Atlases, maps.

856 Ferdinand Hirts Verlag * Breslau und Leipzig * School wall maps, object pictures.

857 Hobbing & Büchle, Verlagsbuchhandlung * Stuttgart, Paulinenstr. 19 * Wall maps, some showing how to use maps.

858 Ed. Hölzel, Verlag * Wien, Luisengasse 5 * Wall maps for intuitive instruction in geography and other branches, maps, &c.

859 Fritz Kindt * Steglitz bei Berlin * Geographical institute. Relief of Vesuvius 1 : 20,000 of natural length; Relief of the Riesengebirge.

860 K. F. Koehler, Verlagsanstalt * Leipzig * Maps.

861 Dr. F. Krantz, Rheinisches Mineralienkontor * Bonn * Reliefs.

862 Kartographische Verlagsanstalt von Georg Lang * Leipzig * School wall maps.

863 E. Morgenstern, Verlagsbuchhandlung * Breslau VI, Königsplatz 1 * School wall maps for lectures on the German classics.

864 A. Müller-Fröbelhaus, Lehrmittelinstitut und Verlagsanstalt * Dresden-Wien * Kuhnert-Leipoldt, School wall maps, simple relief.

865 Justus Perthes, Geographische Anstalt und Verlagsbuchhandlung * Gotha * Maps and atlases.

866 Rengersche Buchhandlung, Gebhardt & Wielisch * Leipzig * Plans of the town.

867 Emil Roth, Verlagsbuchhandlung * Giessen * Maps.

868 Ernst Schotte & Co., Geographisch-artistische Anstalt und Verlag * Berlin W., Potsdamer Str. 41a * Tellurion, planetarium, globes, &c.

869 J. F. Schreibers Lehrmittelverlag * Esslingen bei Stuttgart, München * Wall pictures.

870 E. A. Seemanns Verlag * Leipzig, Querstrasse 13 * Wall pictures.

871 P. Stankiewicz, Buchdruckerei * Berlin, Bernburger Str. 14 * Illustration of a geological section.

872 Velhagen & Klasing, Verlag * Bielefeld und Leipzig * Atlases.

873 F. E. Wachsmuth, Kunst- und Schulbilderverlag * Leipzig * Estb. 1872. Publisher of artistic and coloured object tables, comprising all branches of modern

education. Also publisher of coloured pictures at the cheapest prices, for decorating school rooms and dwellings. 1st prize awarded at all international Expositions. Representative in every capital of the world.

874 H. Wagner & E. Debes, Geographischer Verlag * Leipzig * Hand and school atlases, school wall maps.

875 George Westermann, Verlag * Braunschweig * Atlases and school wall maps.

876 Winckelmann & Söhne * Berlin S., Sebastianstrasse 34 * Geographical object pictures.

877 Hellmuth Wollermann * Braunschweig, Bohlweg 13 * Harms' school wall maps and planispheres.

XVIII. Educational appliances (models, apparatuses, object pictures, &c.).

Elementary, natural-science, physical, technological, mathematical instruction, &c.

878 Amthorsche Verlagsbuchhandlung * Leipzig, Talstr. 5 * Object pictures for botanical and zoological instruction.

879 A. Böttcher, Naturalien- u. Lehrmittelhdlg. * Berlin C., Brüderstr. 15 * Export to all civilized countries. Natural science educational appliances: Anthropology, Zoology, Botany, Mineralogy, Geology, Technology.

880 R. Brendel * Grunewald (Berlin), Bismarckallee 37 * Models for instruction in Botany in schools, agricultural and forestry colleges, universities, &c.

881 Friedrich Ebbeckes Verlag * Lissa i. P. * Establ. 1826. Speciality: manufacture of educational appliances for instruction in reading and writing, text books for the two language national schools.

882 Gustav Fischer, Verlag * Jena * Anatomical wall illustrations.

883 Th. G. Fisher & Co. * Kassel * Wall illustrations for instruction in natural science at High schools and Universities. Illustrations from Wiegand's Acropolis at Athens.

884 Paul Gebhardt Söhne * Berlin C. * Manufactury of physical school apparatus and laboratory fittings. Apparatuses for High schools. See also Section of Ministry of Agriculture.

Ephraim Greiner * Stützerbach in Thüringen * Appliances for instruction in physics. See: Scientific instruments. 885

Albert Hauff, Verlag * Berlin-Schöneberg, Cheruskerstr. 2 * Lamey's calculating apparatus. 886

Ed. Hölzel, Verlag * Wien, Luisengasse 5 * Object pictures for instruction in languages. 887

A. W. Kafemann, G. m. b. H., Verlagsbuchhandlung und Buchdruckerei * Danzig * Four object pictures by Kafemann: Spring, Summer, Autumn, Winter. 2. Edit. 1900. Prize awarded at the Int. Exp. Chicago 1893. Spelling books and school books for national schools. 888

J. Kagerah * Hamburg * Verlag technologischer Lehrmittel. Established 1896. Samples showing the treatment of the most important raw materials. Internat. Educat. Exp. Santiago de Chile 1902/1903: 1st prize. Hamburg 1903: Silver medal. 889

K. F. Koehler, Verlagsanstalt * Leipzig * Object pictures for instruction in ancient languages and history. 890

Dr. F. Krantz, Rheinisches Mineralienkontor * Bonn * Models of crystals, minerals, gyps models. 891

Univ.-Prof. Dr. Hermann Landois * Münster i. W. * Anatomical preparations. 892

Leppin & Masche, Fabrik wissenschaftlicher Instrumente * Berlin SO., Engelufer 17 * Collection of physical apparatuses of a Berlin board school. See: Scientific instruments. 893

C. C. Meinhold & Söhne, Kgl. Hofbuchdruckerei und Lehrmittelverlag * Dresden * Established 1777. Education appliances introduced in German, Austrian and many foreign schools; recommended by the highest school authorities; made in own establishment: Specialities: Object pictures, animal pictures, anat. wall illustrations, &c. See: Special Catalogue of the German Education Exhibition. 894

Erwin Nägele, Verlagsbuchhandlung * Stuttgart * Botanical and zoological wall illustrations. See: Section Text books. 895

Friedrich Andreas Perthes, Akt.-Ges. * Gotha * Object pictures of the Saalburg. Kehr-Pfeiffer's pictures of fables. 896

Gebr. Pippow * Hermsdorf (Mark) * Supply all zoological educational appliances. Catalogue gratis. Gold and silver medals awarded at the Int. Exp. Chicago 1893. 897

898 Wilhelm Plessmann, Münchener Lehrmittelhandlung * München * Transparency of the Northern firmament.

899 F. E. Wachsmuth, Schulbilder- u. Kunstverlag * Leipzig * Pictures representing the history of civilisation; botanical, zoological, technological wall pictures, &c.
See advertisements p. 13.

900 G. Winckelmann, Buchhandlung u. Lehrmittelanstalt * Berlin SW., Friedrichstrasse 6 * Movable geometrical models, collections of woods and insects.

901 Winckelmann & Söhne * Berlin S., Sebastianstr. 34 * Pictures for object lessons and instruction in languages.

XIX. Section for drawing and artistic decoration of walls.

a) Pupils drawings supplied by the following establishments:

902 Knabenvolksschule zu Hannover-Linden.

903 Höhere Töchterschule I zu Hannover.

904 Höhere Töchterschule der Franckeschen Stiftungen zu Halle a. S.

905 Kgl. Augustaschule mit Kgl. Lehrerinnenseminar zu Berlin.

906 Kaiserin-Auguste-Viktoria-Schule zu Stettin.

907 Kgl. Schullehrerseminar zu Bromberg.

908 Kgl. Schullehrerseminar zu Delitzsch.

909 Kgl. Schullehrerseminar zu Reichenbach O.-L.

910 Katholische Realschule zu Breslau.

911 Städtische Realschule zu Erfurt.

912 X. Städtische Realschule zu Berlin.

913 Städtische Oberrealschule zu Bochum.

914 Oberrealschule der Gemeinde Gr.-Lichterfelde (Berlin).

915 Städtische Friedrich-Werdersche Oberrealschule zu Berlin.

916 Realgymnasium zu Altona.

917 Städtisches Realgymnasium zu Iserlohn.

918 Städtisches Realgymnasium "Musterschule" zu Frankfurt a. M.

919 Gymnasium zu Dortmund.

920 Gymnasium und Realgymnasium zu Flensburg.

921 Städtisches Gymnasium zu Stettin.

922 Elisabeth-Gymnasium zu Breslau.

b) Patterns (models) for instruction in drawing, artistic wall decorations, sculptures, busts and portraits.

923 Albrecht-Dürer-Haus Sütterlin & Schöll, Kunstzentrale für Schule und Haus * Berlin, Kronenstr. 18 * Artistic wall decorations, instructional appliances for drawing. Art enterprise with the tendency of spreading good and inexpensive art in wide popular circles; has assisted in the spread of the reform proposed in drawing instruction by the Prussian Ministry of Education, by exhibiting and spreading the new appliances required, which are mostly made after own models. Representatives of the Natural History Institute "Sanders Präparatorium," Cöln a. Rh. Gold medal awarded at Int. Exp. "Kinderwelt," St. Petersburg.

924 Breitkopf & Härtel, Verlagsbuchhandlung * Leipzig.

925 Wilhelm Fechner, Photographisches Atelier * Berlin W., Potsdamer Str. 134a.

926 August Gerber, Deutsche Zentralstelle für klassische Skulpturen, Statuen, Büsten, Reliefs der Antike, des Mittelalters und der Neuzeit, Kunstanstalt * Cöln, Domkloster 3.

927 Gesellschaft zur Verbreitung klassischer Kunst, G. m. b. H. * Berlin * Wall decoration collection of masterpieces of classical art in copper plate printing.

928 Hausmann & Latwesen * Kassel, Weserstr. 21.

929 Ferdinand Hirt, Verlag * Breslau und Leipzig * School wall pictures.

930 C. C. Meinhold & Söhne, Kgl. Hofbuchdruckerei und Lehrmittelverlag * Dresden * School wall pictures.

931 P. Johs. Müller & Co. * Charlottenburg, Spandauer Str. 10a.

932 Lina Pommerening, Porträtmalerin * Berlin W., Winterfeldtstr. 7.

933 Paul Schahl, Verlag * Berlin SO. 16, Neanderstr. 16 * Official lists of educational appliances.

934 J. F. Schreibers Verlag * Esslingen und München * School wall pictures.

935 E. A. Seemanns Kunstverlag * Leipzig, Querstr. 13.

936 B. G. Teubner, Verlagsbuchhandlung * Leipzig.

937 R. Volgtländer, Verlagsbuchhandlung * Leipzig.

938 F. E. Wachsmuth, Schulbilder- u. Kunstverlag * Leipzig.

See advertisements p. 13.

939 Günther Wagner * Factories in Hanover and Vienna, Branches in Berlin and London * Establ. 1838. Artists colours, paint boxes and fluid Indian inks for schools, professions and art; writing and copying inks, gums; photographic colours. Speciality: Brand "Pelikan." Export to all civilized countries. 30 awards (Prussian State medal; medal and ribbon in Boston 1883; gold and silver medals; diplomas; latest award: Gold medal of the Int. Scientific Exp. "Kinderwelt" at St. Petersburg, Febuary 1904). Catalogue gratis and post prepaid.



940 Waisenhaus-Verlag * Halle a. S. * School wall illustrations.

XX. Section for gymnastics, school sports and hygiene.

a) Models.

941 A. Buczilowsky, Turngerätefabrik * Berlin W. 57 * Factory for all gymnastic apparatuses. Model of gymnasium of the 3rd National school at Steglitz near Berlin.

942 Oswald Faber * Leipzig * Turngerätefabrik. Establ. 1863. Factory for all gymnastic apparatuses; driven by machinery. 31 highest prizes, including 16 gold medals.

943 Fr. Lürssen, Bootswerft * Aumund bei Bremen * Model of a boat.

944 Prof. Rich. Anders * Charlottenburg * Model of the GutsMuths monument.

b) Compendiums, plans and pictures.

945 Zentralausschuss zur Förderung der Volks- und Jugendspiele in Deutschland. Vorsitzender: Freiherr von Schenckendorff, Görlitz.

946 Kgl. Landratsamt zu Gelsenkirchen.

947 Prof. Dr. Deipser * Neuwied.

948 Magistrat der Stadt Königsberg i. Pr.

949 Prof. Wickenhagen * Schöneberg (Berlin).

950 Dr. J. A. Schmidt * Bonn a. Rh.

951 H. Fricke, Schulinspektor * Hamburg.

952 Klähr, Oberlehrer * Dresden.

953 Prof. Dr. Kohlrausch * Hannover.

Dr. Lorenz, Realschuldirektor * Quedlinburg. 954

Magistrat der Stadt Eisleben. 955

Magistrat der Stadt Frankfurt a. M. 956

Magistrat der Stadt Posen. 957

Magistrat der Stadt Quedlinburg. 958

c) Books and magazines, &c.

C. H. Beck, Verlag * München. 959

O. Bonde, Verlag * Altenburg. 960

J. G. Cotta, Verlag * Berlin. 961

Fischers Medizinische Buchhandlung (H. Kornfeld) * Berlin W., Lützowstr. 10. 962

J. G. Göschen, Verlag * Leipzig. 963

Grethlein & Co. * Leipzig * Publishers of "Bibliothek für Sport und Spiel," works of the most celebrated writers on sport. 964

M. Hesse, Verlag * Leipzig. 965

A. W. Kafemann, Verlag * Danzig * Ketterhager Gasse 4. 966

Kesselringsche Hofbuchhandlung * Leipzig. 967

J. F. Lehmann, Verlag * München * Tables for measuring. 968

F. Leineweber, Verlag * Leipzig. 969

R. Lion, Verlag * Hof i. B. 970

C. Meyer (G. Prior), Verlag * Hannover. 971

O. Nemnich, Verlag * Wiesbaden. 972

Martin Oldenbourg * Berlin, Friedrichstrasse 239. 973

H. Paetel, Verlag * Berlin W., Elssholzstrasse 12. 974

A. Pichlers Wwe. & Sohn * Wien und Leipzig. 975

Richard Schoetz, Verlag * Berlin, Luisenstr. 36. 976

K. Sieke, Verlag * Rendsburg. 977

Julius Springer, Verlag * Berlin, Monbijouplatz 3. 978

Elwin Staude, Verlag * Berlin, Potsdamer Str. 122 c. 979

Eduard Strauch, Verlag * Leipzig. 980

B. G. Teubner, Verlag * Leipzig. 981

E. F. Thienemann * Gotha * Publisher of educational and scholastic matter. Sample numbers of "Pädagogische Blätter für Lehrerbildung und Lehrerbildungsanstalten." 12 numbers annually at 1 Mark each. 982

Velhagen & Klasing, Verlag * Bielefeld und Leipzig. 983

984 R. Voigtländer, Verlag * Leipzig.

985 Leopold Voss, Verlag * Hamburg.

986 Waisenhausbuchhandlung zu Halle a. S.

987 J. J. Weber, Verlag * Leipzig.

988 Weidmannsche Buchhandlung * Berlin SW., Zimmerstr. 94.

XXI. Manual training and Fröbel work.

989 Deutscher Verein für Knabenhandarbeit zu Leipzig (Direktor: Dr. Pabst) * Statistical diagrams and publications.

990 Schülerwerkstatt zu Leipzig, Gustav-Adolf-Str. 2 * Copies, pictures of models, photographs of school workshops, &c.

991 S. E. Fischer * Oberseiffenbach i. Erzg. * Fröbel appliances for instruction and occupation for use in Kindergartens.

992 W. Ruess, Sculptor and Specialist * Ulm * School curriculums for boys handiwork: scalloped work and carving, joinery, modelling: Method W. Ruess.

993 Franz Siemenroth, Verlag * Berlin Dennewitzstr. 2 * Copies for instruction in manual work.

XXII. School room fittings, furniture, utensils, and apparatuses for instruction.

994 Heinrich Brink * Kassel-Wahlershausen * Special factory for school and gymnasium fittings.

995 A. Buczilowsky * Berlin * See Section V Gymnastics, &c.

996 Friedrich Ebbecke, Verlag * Lissa i. P. Markt 25 * Reading apparatus, stands for maps.

997 Oswald Faber, Turngerätefabrik * Leipzig-Paunsdorf * See Section V Gymnastics, &c.

998 Otto Genetat, Lehrer * Friedrichshagen b. Berlin, Ahornallee 23 * Calculating apparatus.

999 Alois Gusinde, Rektor * Berlin W., Mohrenstr. 41 * Apparatus "Singeschule."

1000 Albert Hauff, Verlag * Berlin-Schöneberg, Cheruskerstr. 2 * Lahmey's calculating apparatus.

1001 Heintze & Blanckertz * Berlin * Est. 1856. Manufactures: Steel pens and penholders.

1002 Camille Lamey, Lehrer * Berlin SW., Yorkstr. 76.

1003 A. C. Lemckes Schultafelfabrik * Kassel * Model of a black board for schools.

1004 Liebig, Lehrer am Gymnasium zu Fraustadt * Model of a stand for hanging wall-maps, &c.

1005 P. Joh. Müller & Co., Werkstätten für Einrichtung und Ausstattung von Schulen * Charlottenburg, Spandauer Str. * Rettig's school-bench, model of a school-room, system of arrangement of school-benches, trestle.

XXIII. Teaching appliances for use of the deaf and dumb, blind, and mentally abnormal.

1006 Kgl. Zentral-Taubstummen-Institut in München, Goethestr. 70.

1007 M. Kunz, Direktor der Blindenanstalt zu Illzach b. Mülhausen i. E.

1008 Hermann Piper, Erziehungsinspektor an der Idiotenanstalt zu Dalldorf bei Berlin.

1009 Städtische Hilfsschule für schwachbegabte Kinder * Stolp in Pommern * Teacher Fr. Frenzel.

XXIV. General.

1010 Kgl. Unterrichtsministerium * Berlin * Two maps of Germany showing the various institutions for education and instruction, intermediate and national schools excepted.

1011 Prof. Dr. Petersilie, Geh. Reg.-Rat * Berlin * Graphic representations and statistical tables concerning education in high, intermediate and elementary schools.

1012 Dr. Leuchtenberger, Geh. Reg.-Rat, Gymnasialdirektor * Cöln a. Rh. * Specimens of the work of the training seminaries for higher teaching positions.

1013 Prof. Dr. Ulbrich, Realgymnasialdirektor * Berlin, Georgenstr. 34–36.

1014 Prof. Dr. Nahrwold, Oberrealschuldirektor * Berlin, Niederwallstr. 12.

2. Single groups.

Group 1.

Elementary education.

See German hygienic exhibit, p. 494.

1015 Dr. Jessen * Strassburg i. E. * a) Wall illustrations "The teeth and their treatment," b) "Sound and bad teeth," c) School dental hospital, Strassburg i. E.

1016 Dr. Jessen, Dr. Loos, Zahnarzt G. Schläger * Pamphlet "The hygiene of teeth in school and army."

Group 5.

Special education in agriculture.

(Agricultural building. See p. 478 and 479.)

a) Joint exhibit of furniture, utensils and apparatuses for the chemical laboratory of an experimental farm.

b) Joint exhibit of the Royal Prussian Ministry for agriculture, woods and estates.

Group 8.

Special forms of education; scientific expeditions.

Exhibited in Transport Building.

1017 German Antarctic expedition.

Duration 28 months, from August 11th 1901 to November 29th 1903.

Chief: Professor Dr. E. von Drygalski.

Members: Prof. Dr. E. Vanhöffen, zoologist and botanist.
Dr. H. Gazert, doctor and bacteriologist.
Dr. Fr. Bidlingmaier, terrestrial magnetician.
Dr. E. Philippi, geologist and chemist.
H. Ruser, captain.
A. Stehr, chief engineer.
W. Lerche, first officer.
R. Vahsel, second officer.
L. Ott, second officer.
Crew of twenty-two men.

In addition, for the observatory at the Kergueles:
Dr. E. Werth, Biologist.
J. Enzensperger †, meteorologist.
Dr. K. Luyken, terrestrial magnetician.
Crew of two men.

Antarctic ship "Gauss" built at the Howaldt yard, Kiel, 1900/01. Length 46 meters, width 10·7 meters, draught 4·8 meters. Triple-expansion engine of 325 h. p. Speed under steam 7 knots with cargo of 725 t, under sail up to 9 knots. Rig: three masted ship, schooner rigged with topsails. Model exhibited by the Howaldt yard, Kiel.

Course of the expedition: investigations at Saõ Vicente, Cape Colony, Crozet Islands, Kergueles, Heard Island, St. Paul, New Amsterdam, Cape Colony, St. Helena, Ascension and the Azores—four months in all.

Investigations in the Atlantic and Indian Oceans, ten months in all, in the Antarctic Ocean fourteen months, of which time eleven and a half months were spent at the winter station and on sledge journeys.

Results: discovery of Kaiser Wilhelm II. Land and the Gauss mountain; numerous scientific works and collections from the Antarctic regions, the different oceans and their islands.

Exhibits: map of the course through the Antarctic Ocean, showing the winter station, photographs, natural products, registry curves, provisions, clothes, sledges, cayaks, snow-shoes and sporting articles.

Provisions of the Expedition exhibited by the "Internationale Schiffsbedarfs-Gesellschaft," Carl Bödiker & Co., Bremerhaven.

Department B.
Art.
(Palace of Fine Arts.)

1. German Art Exhibition.

Groups 9 to 12.

Artistic arrangement of rooms: Prof. Kreis, Dresden.
Artistic arrangement of the secretary's office: G. v. Mayenburg, Architect, Dresden.

Group 9.

Paintings and Drawings.

1028 Andreas Achenbach * Düsseldorf * "Low Water," owned by Eduard Schulte, Düsseldorf.

1029 Oswald Achenbach * Düsseldorf * 1. "Sea at Sunrise." 2. Arch fo Constantine at Rome," owned by National Gallery, Berlin. 3. "Nemi Lake," owned by Mr. Ed. Schulte, Düsseldorf.

1030 Julius Adam * München * "Large Family."

1031 Carl Albrecht * Hamburg * "Still-life."

1032 Theodor Alt * München * "In Rud. Hirth's Atelier."

1033 Anders Andersen-Lundby * München * "Winter's day at Meizing."

1034 Alfred Bachmann * München * "Horseman in the evening Sun (Iceland)."

1035 Fritz Baer * München * 1. "Stormy evening in the Highlands (Ferwall)." 2. "The Kuchenspitze in Ferwall (Tyrol)."

1036 H. Baisch † * Dresden * "Dortrecht at low water," owned by National Gallery, Berlin.

1037 K. Bantzer * Dresden * "Communion service in Hesse," owned by National Gallery, Berlin.

1038 Hans von Bartels * München * 1. "The Mower," water colour. 2. "Breakers."

1039 Heinrich Basedow * Berlin * "Silver stream."

1040 Carl Becker * Düsseldorf * "Evening In fishing port."

1041 Karl Becker † * Berlin * "Charles V. at Fugger's," owned by National Gallery, Berlin.

Carl Bloss * München * "Portrait of the artist." 1042

Theodor Bohnenberger * München * "Chesnut blossoms." 1043

H. Bohrdt * Berlin * "Opening of the Kaiser Wilhelm Canal," owned by National Gallery, Berlin. 1044

Eugen Bracht * Dresden * "The Dead Sea," owned by National Gallery, Berlin. 1045

A. Braith * München * 1. "Irmgrich." 2. "Joyful morning," owned by National Gallery, Berlin. 1046

August von Brandis * Berlin * "Interior, peasant's sitting room, looking into bed-room, Lower Rhine." 1047

Josef von Brandt * München * 1. "Swedish Cavalry in Battle," 2. "Fighting Tartars," owned by National Gallery, Berlin. 1048

Otto Brausewetter * Berlin * "Christ on the Cross." 1049

Georg Burmester * Kiel * "Fresh fallen snow" (Evening). 1050

G. von Canal * München * "Westphalian Mills," owned by National Gallery, Berlin. 1051

W. Clemens * München * "Poacher's End." 1052

Moritz Coschell * Berlin * "A Walk." 1053

Franz von Defregger * München * 1. "Council of War." 2. "Sleeping Child." 3. "Portrait of the painter Gysis." 4. "Tyrolese Landsturm returning in 1809," owned by National Gallery, Berlin. 5. "Pilgrims." 1054

Konrad Dielitz * Berlin * "Woodmen." 1055

Wilhelm von Diez * München * 1. "Rest at the Ruins." 2. "Forest feast," owned by National Gallery, Berlin. 1056

1057 Willi Döring * Berlin * "Portrait of Miss Victoria V."

1058 Eugen Dücker * Düsseldorf * "Sea at Stralsund," owned by the artist.

1059 A. Echter * München * "After the Masquerade."

1060 Andreas Egersdörfer * Frankfurt a. M. * 1. "In Holland." 2. "Wharve."

1061 Julius Ehrentraut * Berlin * 1. "Strategists." 2. "Inspection." 1 and 2 from the private apartments of H. I. M. the Emperor.

1062 Rudolf Eichstädt * Berlin * "Blücher in Genappe."

1063 Otto Heinrich Engel * Berlin * 1. "Sunset." 2. "Evening. Fishing for haddocks." 3. "The Walk."

1064 Georg Herrmann Engelhardt * Berlin * "Upper Finster valley near Küchtal" (Tyrol).

1065 Alois Erdtelt * München * 1. "Portrait of my father." 2. "Adorned for God," or "Confirmation Candidate." 3. "Girl's Head."

1066 Richard Eschke * Berlin * 1. "The Spree near Leipe, Spreewald." 2. "Horseradish fields near Leipe, Spreewald."

1067 Otto v. Faber du Faur † * München * 1. "A Campaign." 2. "The Horses of the Emir."

1068 Hanns Fechner * Berlin * 1. "Lady in Black." 2. "Theodore Fontane," owned by the town of Berlin.

1069 Louis Feldmann * Düsseldorf * 1. "Vision of St. Francis." 2. "Meeting at the crossways."

1070 Wilhelm Feldmann * Berlin * 1. "When the mist rises." 2. "Evening country scene." 3. "Solitude in the Fields."

1071 Anselm Feuerbach † * Düsseldorf * 1. "Dante and the noble women." 2. "Concert," owned by National Gallery, Berlin.

1072 August Fink * München * "Winter evening in the park of Nymphenburg."

1073 Walther Firle * München * 1. "The Lord's Prayer" (Triptychon): a) "Give us this days our daily bread," b) "Thy will be done," c) "Forgive us our trespasses." 1. a to c owned by the Munich Pinakothek. 2. "Alone in the world."

1074 Adolf Fischer-Gurig * Dresden * "East Friesian Shipbuilding Yard."

1075 Ludmilla von Flesch-Brunningen * München * "Anointment of young witches."

1076 P. Flickel † * Berlin * "Beech forest near Prerow," owned by National Gallery, Berlin.

1077 Robert Forell * München * 1. "Death of Count Wilhelm of Mansfeld." 2. The frame belonging to above, owned by the Kaiser Wilhelm Museum at Crefeld.

1078 Alexander Frenz * Düsseldorf * "The golden era," owned by Kommerzienrat Dr. Schoenfelder, Düsseldorf.

1079 Victor Freudemann * Berlin * "German Cemetery covered by snow."

1080 Richard Friese * Berlin * 1. "A difficult Walk." 2. "Stag of twenty two points pursued by bloodhounds." 3. "Elk hunting in Winter." 2 and 3 owned by H. I. M. the Emperor. 4. "On the old wall," owner National Gallery, Berlin.

1081 Gebhard Fugel * München * "Christ before the Sanhedrim."

1082 Alexander Fuks * München * "Study."

1083 M. Gaisser * München * "At the Lawyers," owned by the Munich Pinakothek.

1084 Eduard von Gebhardt * Düsseldorf * "The rich disciple," owned by the Municipal gallery of Düsseldorf.

1085 O. Gebler * München * "Art critics in the Stables," owned by National Gallery, Berlin.

1086 Berthold Genzmer * Berlin * 1. "Spreewald children." 2. "Curisch Girls."

1087 Friedr. Geselschap † * Berlin * "Design of the Hamburg Town Hall," owned by the Municipality of Hamburg.

1088 Franz Grässel * München * "Ducks."

1089 Peter Greeff * Düsseldorf * "Birches at the edge of the forest."

1090 Eduard Grützner * München * 1. "Sir John Falstaff." 2. "Still life." 1 and 2 are only to be sold to a public gallery or museum.

1091 Anna Gumlich-Kempf * Berlin * "Tomatoes."

1092 Nikolaus Gysis * München * 1. "The little Reader." 2. "Art and her geniuses." 3. "Pilgrimage." 4. "Negro with cigarette." 1 and 2 owned by the Mayor of Munich.

1093 Richard Hagn * Dresden * 1. "North Friesian peasants room." 2. "North Friesian peasant cottage."

1094 Willy Hamacher * Berlin * "Ruins by the Sea."

1095 Carl Hartmann * München * "Harvest time."

1096 Ernst Hausmann * Berlin * "Autumn Forest."

1097 Otto Helchert * Düsseldorf * "In the sweat of thy brow shalt thou eat the bread."

1098 Heinrich Helmes * Düsseldorf * "Fishing boats on the shore."

1099 Ernst Henseler * Berlin * "The day's work ended."

1100 Hans Herrmann * Berlin * 1. "Flower-market, Amsterdam." 2. "Dutch Fishing village," property of the Royal National Gallery, Berlin.

1101 August Herrmann-Allgäu * München * 1. "Pomegranates." 2. "Onions and garlic."

1102 Johann Herterich * München * "Vain warning."

1103 Ludwig Herterich * München * "The heroine of Lüneburg," property of the Lübeck Museum.

1104 Carl Heyden * Düsseldorf * "Roofs" (Old Düsseldorf).

1105 Friedrich Heyser * Dresden * "Portrait of Professor Wislicenus."

1106 Rud. Hirth du Frênes * München * "Picture-book."

1107 Franz Hoch * München * "In cypress' shade."

1108 Franz Hochmann * Dresden * "Autumn."

1109 Franz Hoffmann-Fallersleben * Berlin * "The altar on the Oldenburg heath."

1110 August Holmberg * München * "Evening."

1111 Carl Holzapfel * Kassel * "Finkenwärder fishing cutter on the Elbe at Hamburg."

1112 Paul Horst-Schulze * Leipzig * 1. "Wanderlust," Oil-tempera. 2. "In a shady grove."

1113 Max Hünten * Düsseldorf * "Autumn storm."

1114 Julius Jacob * Berlin * "Hafenplatz, Berlin."

1115 Gerhard Janssen * Düsseldorf * 1. "Portrait of the artist." 2. "Toll und Voll."

1116 Peter Janssen * Düsseldorf * "Battle of Worringen," property of the town-gallery, Düsseldorf.

1117 Hermann Junker * Karlsruhe * "Horses."

1118 Friedrich Kallmorgen * Berlin * "The Maas at Rotterdam."

1119 A. Kampf * Berlin * "Professor Steffens inciting to insurrection at Breslau in 1813," property of the Royal National Gallery, Berlin.

Fritz August von Kaulbach * München * "Portrait of H. I. M. the Empress with Princess Victoria," property of the school mistresses Seminary at Droyssig. 1120

Carl Kayser-Eichberg * Berlin * "Evening sun before the Storm." 1121

Ferdinand Keller * Karlsruhe * 1. "Portrait of H. I. M. Emperor William II." 2. "Böcklin's Grave." 3. "Nymphs Bath." 1122

Conrad Kiesel * Berlin * 1. "Study in black." 2. "Portrait of Countess Matuschka," property of Mr. E. H. Walker, Detroit. 1123

Paul Kiessling * Dresden * 1. "Decorative work." 2. "Portrait of the architect of the Niederwald monument" (Johannes Schilling). 3. "Study of head for a portrait" (Viceadmiral S.) 1124

Karl Knabl * München * "Voyage by raft on the Isar." 1125

L. Knaus * Berlin * "Wie die Alten sungen" (The young pigs grunt like the old sow), property of the National Gallery, Berlin. 1126

Hermann Knopf * München * "The Giant toy." 1127

Hans Koberstein * Berlin * "The Son," property of the Emperor William Museum at Crefeld. 1128

Ernst Koerner * Berlin * 1. "Torre del Agua" (Alhambra). 2. "The Memnons Colossus" (Upper Egypt). 1129

Alexander Koester * Karlsruhe * 1. "A flight of ducks." 2. "Picture of ducks" (in evening sun). 3. "At the duck pond." 1130

Max Koner † * Berlin * "Portrait of H. I. M. Emperor William II.," property of Geh. Kommerzienrat Arnhold, Berlin. 1131

Alfred von Kowalski-Wierusz * München * "After the Rain." 1132

Christian Kröner * Düsseldorf * 1. "Forest picture with roebuck," property of Kommerzienrat Dr. Schönfeld, Düsseldorf. 2. "Rivals," property of the artist. 1133

Carl Kronberger * München * "Woman from the Dachau district (Upper Bavaria)." 1134

E. Kubierschky * München * "Silesian Spring landscape," property of the National Gallery, Berlin. 1135

G. Kuehl * Dresden * "Altmännerhaus in Lübeck," property of the National Gallery, Berlin. 1136

Carl Küstner * München * 1. "Winter Evening." 2. "March Day" (Moss landscape), property of the Munich Pinakothek. 1137

1138 Wilhelm Kuhnert * Berlin * 1. "Roaring Lions." 2. "On the Flight."

1139 L. Adam Kunz * München * 1. "Truth and Fiction."

1140 Fritz Lang * Stuttgart * "Aquarium."

1141 Carl Langhammer * Berlin * 1. "Evening." 2. "The Sun in a mist."

1142 Anton Laupheimer * München * "Holidays."

1143 Theodor Lauxmann * Stuttgart * "Portrait."

1144 W. Leibl † * Aibling bei Rosenheim * "Portrait of the Freiherr M. von Perfall," property of the Munich Pinakothek.

1145 Karl Lelpold * Kiel * "Mill in the Marsch country."

1146 Franz von Lenbach * München * 1. "Frau Lilly Merk." 2. "Child with Cat." 3. "Dr. Hammacher."

1147 Konrad Lessing * Berlin * 1. "At the Neuhofer Pond." 2. "Twilight."

1148 Hermann von Le Suise * München * "November Evening."

1149 H. Liesegang * Düsseldorf * 1. "Autumn Grove." 2. "Dutch Mill."

1150 Clara Lobedan * Berlin * "Azalea, in red light."

1151 L. von Loefftz * München * "Orpheus and Eurydice," property of the Munich Pinakothek.

1152 W. Löwith * München * "In the antechamber of the minister," property of the Munich Pinakothek.

1153 K. Ludwig † * Berlin * "St. Gothard Pass," property of the National Gallery, Berlin.

1154 Adolf Männchen * Düsseldorf * "The hour of Death."

1155 Otto Marcus * München * "On the Mole at Concarneau."

1156 H. von Marées * München * "St. George," property of the National Gallery, Berlin.

1157 Johannes Martini * Berlin * "Breakfast in the locomotive workshop."

1158 Gustav Marx * Düsseldorf * "Over the red Heath."

1159 Gabriel von Max * München * 1. "Florence," study of a head. 2. "Jesus heals a sick child," property of the National Gallery, Berlin.

1160 Adolf von Menzel * Berlin * 1. "Woman messenger," property of Geh. Commerzienrat Arnold, Berlin. 2. "Iron rolling mill." 3. "Departure of King William for the Army in 1870," property of the National Gallery, Berlin.

Hans Meyer * Berlin * "View of Wertheim a. M., Autumn." 1161

Kunz Meyer * München * 1. "Parsifal." 2. "A warrior." 1162

Paul Meyerheim * Berlin * 1. "Charcoal burners in the mountains," property of the Hamburg Art Hall. 2. "Parade of Equestrians." 1163

Georg Ludwig Meyn * Berlin * "Frau von Cotta." 1164

Hugo Mleth * Berlin * "Supper." 1165

Alfred Mohrbutter * Kiel * "Old Gehring." 1166

Paula Monjé * Düsseldorf * "Julia Capulet." 1167

Hugo Mühlig * Düsseldorf * 1. "Stragglers at the Battue," property of Geh. Commerzienrat Dr. Schoenfeld." 2. "Spring," property of Miss Schleicher, Düren. 1168

Richard Müller * Dresden * 1. "Old Woman." 2. "Man with fur cap." 1169

Franz Müller-Münster * Berlin * "Romance." 1170

Müller-Schoenefeld * Berlin * "Portrait of Frau St." 1171

Wilhelm Nagel * Karlsruhe * 1. "Falling Leaves." 2. "Winter Evening." 1172

Eduard Niczky * "Springtime," property of Herr Ed. Schulte, Düsseldorf. 1173

William Pape * Berlin * 1. "Before the Sermon" (In the Sylt village church). 2. "A Death bed marriage." 1174

Georg Papperitz * München * 1. "Lady in fur with a dog." 2. "Half length picture of a young girl," property of the Munich Pinakothek. 1175

Anton Pepino * Dresden * "At the Writing table," property of the town of Dresden. 1176

Hans von Petersen * München * "Breakers." 1177

Walter Petersen * Düsseldorf * "Portrait of Prof. Emilie Sauret in Chicago." 1178

Heinr. Petersen-Angeln * Düsseldorf * "At the entrance, near Yimuiden (Holland)." 1179

Peter Philippi * Düsseldorf * 1. "A Visit." 2. "Winkelweisheit" (Corner wisdom). 1180

Ernst Max Pietschmann * Dresden * "Joseph and Mary." 1181

Hermann Emil Pohle * Düsseldorf * 1. "Success to Life." 2. "Girl with a Rose." 1182

Rudolf Possin * Berlin * "Head of an old man." 1183

1184 Otto Propheter * Karlsruhe * "Portrait of Prof. Ferdinand Keller."

1185 Fritz Rabending * München * "On the Schlern (The Dolomites)."

1186 Prof. Wilhelm Räuber * München * 1. "Lady's Likeness (Frl. E.)." 2. "Death of Gustavus Adolphus in the battle of Lützen." 3. "St. Hubertus," property of the Munich Pinakothek.

1187 K. Raupp * München * "Peace," property of the National Gallery, Berlin.

1188 Julius Rehder * Hamburg * "Child's likeness."

1189 Woldemar Graf von Reichenbach * Dresden * 1. "Garden of the Capuchins at Salzburg." 2. "Drunken Silenus and Faun." 3. "Gloria Doloris."

1190 Caspar Ritter * Karlsruhe * "Carmen."

1191 Theodor Rocholl * Düsseldorf * 1. "In the Enemy's Country." 2. "Count York's Expedition to Kalgan," property of the National Gallery, Berlin.

1192 Carl Röchling * Berlin * "Fishermen behind a Mill."

1193 Franz Roubaud * München * "Fight in a forest, an episode in the conquest of the Caucasus."

1194 Maximilian Schaefer * Berlin * "Summer Joys."

1195 Philipp Otto Schaefer * München * "Venus Anadyomene."

1196 Joseph Scheurenberg * Berlin * 1. "Portrait of Director A. von Werner," property of the Academical Art High School, Berlin. 2. "Portrait of Geh.-Rat Ende," property of the Academical Art High School, Berlin. 3. "Mary meeting a sheperd boy," property of the National Gallery, Berlin.

1197 Osmar Schindler * Dresden * "David and Goliath."

1198 Ed. Schleich † * München * "Evening landscape," property of the National Gallery, Berlin.

1199 Max Schlichting * Berlin * "Strand pleasures."

1200 Mathias Schmid * München * "The Tyrolese War of Independence."

1201 Josef Schmitzberger * München * "Autumn Gold."

1202 Hugo Schnars-Alquist * Hamburg * "Atlantic billows."

1203 Hermann Schnee * Berlin * "Old town in the Harz mountains."

1204 G. Schönleber * Karlsruhe * "Enzwehr near Besigheim," property of the National Gallery, Berlin.

1205 Richard Scholz * München * "Portrait."

1206 Gustav Schraegle * Frankfurt a. M. * "Portrait of the artist."

1207 Adolf Schreyer * Cronberg i. Taunus * "Arabian Sheik," property of Mr. Ed. Schulte, Düsseldorf.

1208 Wilhelm Schreuer * Düsseldorf * 1. "Rest at posting station," property of Mr. Constantin Luck. 2. "Hussars on the Heath," property of Rechn.-Rat Bauer.

1209 Albert Schröder * München * "Artistic Pause."

1210 Bernhard Schröter * Meissen * 1. "Birches in Snow." 2. "The new coat of paint."

1211 Werner Schuch * Berlin * 1. "Seydlitz." 2. "Zieten." 1 and 2 property of the National Gallery, Berlin.

1212 Raffael Schuster-Woldan * München * 1. "On an open Summit." 2. "Diana." 3. "Woman by the Sea," property of the Munich Pinakothek.

1213 Hermann Seeger * Berlin * "On the border of the field."

1214 Adolf Seel * Düsseldorf * "Courtyard in Venice."

1215 Franz Simm * München * "Small Soiree of Napoleon's at St. Cloud."

1216 Franz Skarbina * Berlin * 1. "Before the departure." 2. "The old meadow at Carlsbad."

1217 Eugen Spiro * Breslau * 1. "Portrait of Prof. Richard Muther." 2. "Danseuse."

1218 K. Spitzweg † * München * "Anchorite, reading," property of the National Gallery, Berlin.

1219 Robert Sterl * Dresden * "At the Spring."

1220 Otto Strützel * München * "Spring."

1221 Walter Thor * München * 1. "Own Portrait." 2. "Lady's Portrait." 3. "Peasants Kitchen in Leutasch." 4. "The Lady Artist."

1222 Hans Unger * Dresden * 1. "Portrait of my Wife." 2. "Own Portrait." 3. "Flamingoes on the Mediterranean."

1223 Hugo Ungewitter * Düsseldorf * "Attack of Cuirassiers," property of the artist.

1224 Max Uth * Berlin * 1. "From a little German Town." 2. "Poplars, October evening."

1225 Jacoslav Franz Julius Věšin * München * "In front of the Horse Market in Macedonia."

1226 Hugo Vogel * Berlin * 1. "Going Home." 2. "Mother and Child."

1227 Heinrich Vogeler * Worpswede * 1. "The Return Home." 2. "Melusine Fairy Tale."

1228 Paul Vorgang * Berlin * "A Stormy Day."

1229 R. Warthmüller † * Berlin * "Frederick the Great at the body of Schwerin," property of the Berlin National Gallery.

1230 Carl Wendling * Berlin * "Picture of an old Alderman."

1231 Gustav Wendling * Düsseldorf * 1. "A Zeeland Interior." 2. "Approaching Spring" (North German landscape).

1232 Josef Wenglein * München * "Evening on a High Moor."

1233 A. von Werner * Berlin * "European Congress in Berlin," property of the town of Berlin. 2. "Emperor William in the Mausoleum at Charlottenburg," property of the Silesian Museum, Breslau. 3. "In temporary quarters before Paris," property of the Berlin National Gallery. 4. "Emperor William with his cadets." 5. "The Emperor congratulating Field-marshal Count Moltke on his ninetieth birth-day," property of the Hohenzollern Museum in Berlin. 6. "Emperor William I. on his Death-bed," property of the Provincial Museum at Hanover.

1234 Fritz Westendorp * Düsseldorf * "Entry to a Beguinage courtyard."

1235 August Westphalen * Kiel * "Peat Cutting."

1236 Fritz Wichgraf * Berlin * 1. "President Krüger receives a Boer Deputation in the Executive Council."

1237 Olga Wiesinger-Florian * München * "Flower bed in Grafenegg Park."

1238 Rud. Bernard Willmann * München * "Lobster and Turtle."

1239 Josef Willroider * München * "At the Brook."

1240 Ludwig Willroider * München * "The Altmühl Valley."

1241 Friedrich Wirnhier * München * "Children reading."

1242 Anna Marie Wirth * München * "Bookshop at Antwerp."

1243 Fritz Wucherer * Frankfurt a. M. * "Morning" (Appletrees).

1244 Karl Ziegler * Berlin * 1. "Own Portrait." 2. "Portrait of my Father." 3. "Portrait of Frau Maler Stutz."

Ernst Zimmermann † * München * 1. "In the Fisher's Hut." 2. "Study of a head." 1245

Group 10.

Engravings and Lithographs.

Max Bärenfänger * München * 1. "Bavarian Peasant Girl," wood-cut. 2. "John Chambers, body physician to Henry VIII. of England," etching. 1246

Franz August Börner * Berlin * 1. "The flute Concert of Frederick II.," after A. von Menzel, etching. 2. "Shepherds Complaint," after Böcklin, mezzotint. 3. "Angelina," after F. von Lenbach, mezzotint-three colour print. 1247

Ettore Cosomati * Frankfurt a. M. * "Autumn." 1248

Gustav Ellers * Berlin * "Frederick the Great travelling," after the painting from A. von Menzel. 1249

Otto Heinrich Engel * Berlin * 1. "Evening glow," coloured etching (printed with 3 plates). 2. "Return Home," Original lithography. 1250

Moritz van Eyken * Berlin * 1. "Death and the Violin player." 2. "Beethoven." 1251

Max Fabin * Berlin * "Tears." 1252

Wilhelm Feldmann * Berlin * 1. "Summer evening." 2. "A lake in the Mark." 1253

Otto Gampert * München * 1. Triple frame, containing etchings of the "Brook," "On the banks of the Danube," "Dachauer Moos." 2. "At the pond," original etching. 3. "River landscape," original etching. 1254

Ismael Gentz * Berlin * "Three portraits of celebrated Personages," in pencil (in one frame). 1255

Bruno Héroux * Leipzig * 1. "Witchcraft." Herkomer process, printed on Japanese paper. 2. "Portrait," original pen and ink drawing on stone, printed on Japanese paper. 3. "Exlibris," Graf Leiningen-Westerburg, original etching, Remarque print. 4. "Exlibris," M. Flueckiger, original etching, Remarque print. 5. "Exlibris," A. Liebsch, original wood cut, Remarque print. 6. "Exlibris," G. Troje, original wood cut, hand printed. 7. "Exlibris," Dr. R. Neumann, original etching, Remarque print. 1256

Martin Hönemann * Berlin * "Girl Reading." 1257

1258 Louis Jacoby * Berlin * "Marriage of Alexander and Roxane," after an old Fresco of Bazzi, called Sodoma in the Farnesia at Rome.

1259 Georg Jahn * Dresden * 1. "Pan and the Child." 2. "The dead Shepherd."

1260 Oswald Kresse * München * 1. Wood-cut, after K. Marr. 2. Three wood-cuts, after Fr. Stahl.

1261 Fritz Krostewitz * Berlin * 1. "Harvestime," after Corot. 2. Etchings, after Corot. 3. "Forest keepers," after Troyon.

1262 Albert Krüger * Berlin * 1. "Portrait of a young Girl," after Piero della Francesca. 2. "Portrait of a Doge," after Giovanni Bellini.

1263 Ludwig Kühn * Berlin * 1. "St. Paul in the Chamber," etching after Rembrandt. 2. "Old Lady," etching after Rembrandt. 3. "The Hohenzollern tower at Nuremberg," original lithography. 4. "Portrait of the artist," original lithography (in 3 colours).

1264 Georg Lührig * Dresden * "Poor Lazarus" (16 sheets of lithographs).

1265 Hans Meyer * Berlin * 1. "Peace," copperplate engraving, after Friedrich Geselschap. Original in Zeughaus in Berlin. Remarque print. 2. "A Dance of Death." Three etchings of a large Cycle. Original etchings, Remarque print.

1266 Richard Müller * Dresden * 1. "Mein Quick." 2. "Exlibris." 3. "Fowl." 4. "Stuebelallee," drawing.

1267 Karl Oenike * Berlin * 1. "Still lies the Sea." 2. "At the meadow Brook." 3. "Meadows."

1268 Ernst Max Pietschmann * Dresden * "At the Brook."

1269 Johannes Plato * Berlin * 1. "Intermezzo" (King and Fool). 2. "Stag Hunt," after Rubens.

1270 Otto Protzen * Berlin * 1. "November Storm." 2. "Baltic Coast." 3. "At Wannsee."

1271 Doris Raab * München * 1. "Madonna," after Holbein, copper engraving, Remarque print. 2. "Female portrait," after Rembrandt, etching on parchment. Remarque print.

1272 Heinrich Reifferscheid * München * 1. "Old man in Study." 2. "To Annette von Droste-Hülshof."

1273 Otto Reim * Berlin * "Banquet of Plato," after Feuerbach.

1274 Theodor Sander * Berlin * "November Evening," original etching.

1275 Heinrich Schlumprecht * München * Two wood-cuts, after drawings of Friedr. Stahl.

1276 Hans Seydel * Berlin * Portrait of Prof. Theodor Mommsen.

1277 Wilhelm Steinhausen * Frankfurt a. M. * 1. "This man receiveth sinners and eats with them," painted lithograph. 2. "Come anto me all ye that are weary and heavy laden, and I will give you rest."

1278 Konrad Strobel * München * Two wood-cuts in one frame. (A wood-cut after a water colour painting of Friedr. Stahl, the other wood-cut after an Indian ink drawing of G. Clooss.)

1279 Hermann Struck * Berlin * 1. Frame with 7 original etchings. 2. "Old man with a white beard," original etching.

1280 Paul Theuerkorn * München * 1. "The dangerous Piano-player." 2. "An Awful Dream." After original drawings of Adolf Oberländer.

1281 Rudolf Thienhaus * Berlin * 1. "Girl in a Japanese Costume." 2. "Head of a Girl."

1282 Hermann Vogel * Dresden * 1. Memorial tablet for the 100th birthday of Ludwig Richter. 2. Memorial tablet for the 100th birthday of Moritz von Schwind. 3. "Nursery, in fairy-tale style." 4. "Coal famine."

1283 Walter Ziegler * München * 1. "Motive from Burghausen." 2. "Torrent in Winter."

Group 11.

Sculpture.

1284 Georg Bäumler * Frankfurt a. M. * "Aphrodite."

1285 Max Baumbach * Berlin * "Sibylla," bronze figure.

1286 Reinhold Begas * Berlin * 1. "Pan and Psyche," bronze group. 2. "Sarcophagus," bronze mortuary monument. 3. "Mercury," bronze figure. 4. "Bismarck," bust in marble. 5. "Moltke," bust in marble. 6. "Portrait bust of A. von Menzel," in marble. 7. "The electric spark," marble group.

1287 Eduard Beyrer * München * "Caecilia," Marble bust on pedestal.

1288 Reinhold Boeltzig * Berlin * "Fountain group," lifesize, in bronze.

1289 Peter Breuer * Berlin * 1. "Adam and Eve," group in marble. 2. "Suffer the little children to come unto me," group in plaster. 3. Equestrian statue "Kaiser Friedrich III." in plaster (exhibited in Cologne).

1290 A. Brütt * Berlin * "Saved," (fisherman with rescued girl) in bronze. Property of the Royal National Gallery, Berlin.

1291 Georg Busch * München * "The prodigal son," bronze.

1292 Fritz Christ * München * "Colchicum."

1293 Gustav Eberlein * Berlin * "God the father breathing life into Adam," group in bronze.

1294 Heinrich Epler * Dresden * 1. "Two mothers," group from the Flood, original model. 2. "Child at play," marble statuette.

1295 Rich. Daniel Fabriclus * Dresden * "Eve," bronze statuette, silvered.

1296 Ernst Freese * Berlin * 1. "At morn," life-sized marble statue and pedestal. 2. "Girl bathing," small marble figure on wooden pedestal.

1297 Ernst Moritz Geyger * Florenz * 1. "Baboon with negro mask," bronze. 2. "The Sirens on dolphins," bronze.

1298 Johannes Götz * Berlin * 1. "Athlete," bronze. 2. "Balancing boy," bronze.

1299 Max Heilmaier * München * "Persecuted Bacchant," bronze.

1300 Fritz Heinemann * Berlin * 1. "Cain," colossal statue in bronze. 2. "Fencer," bronze statuette.

1301 Bernhard Heising † * Berlin * "The prodigal son," bronze. Property of the Dresden Municipality.

1302 E. Herter * Berlin * "The death of Achilles," marble.

1303 Heinr. Rudolph Hölbe * Dresden * "Nymph."

1304 Erich Hösel * Dresden * 1. "Hun," small, and 2. "Hun," large bronze statue.

1305 E. Hundrieser * Charlottenburg * "Queen Louise," marble. Property of the Royal National Gallery, Berlin.

1306 Adolf Jahn * Berlin * "Professor P.H."-bust.

1307 Gerhard Janensch * Berlin * 1. "German girl," marble. 2. "The artist's three children," terracotta.

1308 Karl Kiefer * München * "John," bust of a boy in bronze.

Emil Klemlen * Stuttgart * "Repentance." 1309

Max Klein * Berlin * "Teutons in the circus at Rome." 1310

Richard König * Dresden * 1. "Vanquished," group. 2. "After the fight," statuette. 1311

Josef Körschgen * Düsseldorf * "Persian greyhound," bronze. 1312

Ferdinand Lepcke * Berlin * "Surprised," group in bronze. 1313

J. Lessing * Berlin * "L. Knaus," bust in marble; property of the Royal National Gallery, Berlin. 1314

Rudolf Maison † * München * "Odin." 1315

L. Manzel * Charlottenburg * "Evening song," bronze; property of the Royal National Gallery, Berlin. 1316

Karl Merz * München * "Repentance." 1317

Heinrich Missfeldt * Kiel * 1. "Klaus Groth," statuette. 2. "Ball player," statuette. 1318

Hermann Möller * Berlin * "Woman milking a goat." 1319

Paul Oesten * Berlin * "Erblich belastet" (Tainted by heredity disease), gilded bronze. 1320

Herm.-Joachim Pagels * Berlin * 1. "Pessimist." 2. "Snake." 1321

Carl Roeder * Dresden * "Girl reading." 1322

Martin Schauss * Berlin * 1. "Angel of peace," original bronze. 2. "Ivonne," girls head in marble. 3. "Slave woman," bronze statuette. 1323

Johannes Schilling * Dresden * 1. "Danaid," bronze figure for a fountain. 2. "The Trout," bronze figure for a fountain. 3. Free copy of figures grouped together from the national monument of the Niederwald: "Germania," "War," "Peace," and "Rhine and Moselle group" in bronze on marble pedestal. 1324

Erich Schmidt-Kestner * Berlin * "Milking time." 1325

Walter Schott * Berlin * "Ball player." 1326

Georg Schreyögg * München * "Vase bearer," bronze fountain figure. 1327

Carl Seffner * Leipzig * 1. "Beethoven," head in marble. 2. "Fly-catcher," bronze statuette. 1328

Constantin Starck * Berlin * 1. "Dreams." 2. "Miss Isadora Duncan." 3. "Flora." 1329

Ludwig Vordermayer * Berlin * "A cock." 1330

Heinrich Wadere * München * "Giulia," bronze bust. 1331

1332 Wilh. Wandschneider * Berlin * 1. "Care," bust in marble. 2. "Coriolanus," colossal statue in bronze. 3. Bust in tin.

1333 Ernst Wenck * Berlin * 1. "Girl drinking." 2. "Victoria," bronze.

1334 Selmar Werner * Dresden * 1. "Sculpture of the architect Wilhelm Kreis," in marble. 2. "Portrait in bronze of the painter Hans Unger."

1335 Emil Wünsche * München * "Russian greyhounds."

Group 12.

Architecture.

1336 Breslauer & Salinger * Berlin * 1. "Seamen's house at Wilhelmshaven." 2. ditto—framed photograph.

1337 Cremer & Wolffenstein * Berlin * Façade of St. Hedwig's Presbytery, Berlin.

1338 Martin Dülfer * München * 1. "Town theatre, Meran (Tyrol)," water colour painting. 2. "Building of the "Allgemeine Zeitung," Bayerstr. 57/59, Munich." 3. "Zoological garden in the Ducal park, Munich" (projected).

1339 Erdmann & Spindler * Berlin * 1. "Hall of the Aktienbrauerei-Ges. Moabit, Berlin," perspective view of outside. 2. ditto—perspective view of interior.

1340 Eduard Fürstenau * Berlin * "Synagogue, Dortmund."

1341 Felix Gensmer * Berlin * 1. "Crush room of the Royal theatre, Wiesbaden," built 1901/02. 2. "High-school for girls Wiesbaden," built 1898 to 1901.

1342 Hans Grässel * München * 1. "The new municipal Foundling Hospital, Munich," ground-plan and two views. 2. "Dwelling house in the Beethovenstrasse in Munich," ground-plan and one view.

1343 Arnold Hartmann * Berlin * 1. "Memorial tower." 2. "Bismarck column, Cöln."

1344 Max Hasak * Berlin * 1. "Reichsbank, Cöln," façade. 2. ditto—interior view.

1345 Georg von Hauberrisser * München * 1. "New Town Hall, Munich," design. 2. The same.

1346 König & Söldner * München * 1. "Dwelling house Burri in the Konradstrasse, Munich, from the garden." 2. "Business premises of the firm Isidor Bach, Sendlinger Strasse, Munich." 3. "Dwelling house Vanoni in Deggendorf."

Wilhelm Kreis * Dresden * 1. "Bismarck mausoleum." 2. "Assembly rooms, Eisenach." 3. "Burschenschaftsmonument, Eisenach." 1347

Otto March * Berlin * 1. "Crematorium, Eisenach." 2. "Evangelical Church, Delbrück." 3. "Evangelical Church for Charlottenburg." 4. "House Horst near Düsseldorf." 5. "Country house of Luttitz near Aix-la-Chapelle." 6. "Country house Elmenhorst on the harbour at Kiel." 1348

Georg H. von Mayenburg * Dresden * 1. "Interior of a hall." 2. "Exterior of a country house." 3. "Perspective view of a Bismarckturm." 4. "Perspective view of the Chinese corner of the German Buildings Exhibition." 1349

Richard Michel * Frankfurt a. O. * "Muri-Amthof, Bremgarten (Switzerland), court and tower to the westward after the renovation." 1350

Bruno Möhring * Berlin * 1. "Bridge over the Syratal." 2. "Buttress of the bridge over the Rhine at Basle" (competition plan). 1351

William Müller * Berlin * "Bismarck monument at Hamburg" (competition plan, second prize). 1352

Paul Pfann, Architect and E. Pfeifer, Sculptor * München * "Ludwig's fountain, Aschaffenburg." 1353

Martin Pietzsch * Dresden * 1. Thar-coal sketch of a tomb. 2. Water colour sketch of a private family house. 1354

Gebrüder Rank * München * 1. "Hauser Estate." Views and ground-plan. 2. "Entrance hall to a villa in Thalkirchen." 1355

Franz Rank, Architect and Eduard Beyrer * München * "Second prize in the competition for the Bismarckdenkmal, Hamburg." 1356

Otto Rieth * Berlin * "View of the Staudt Palace, Berlin W., Tiergartenstrasse 9 a." 1357

Richard Schleinitz * Dresden * "Evangelical church, Moritzburg near Dresden." 1358

Freiherr Heinrich von Schmidt * München * "Church of St. Maximilian, Munich" (tree frames). 1359

Fritz Schumacher * Dresden * Ten studies: 1. "Suspension bridge." 2. "Bismarckdenkmal." 3. "Emporium." 4. "Nietzsche monument." 5. "Leopardfountain." 6. "Villa." 7. "The Church." 8. "A prince's Bath." 9. "Gates for a Palace of Justice." 10. "Montsalvat." 1360

1361 Emanuel Seidl * München * "House of Emanuel Seidl, Munich, Bavariaring 10" (four frames).

1362 Gabriel von Seidl * München * National Museum, Munich. 1. Pen and ink drawing: a) "Large perspective," b) "Armoury," c) "Chapel," d) "Studies of buildings." 2. "Villa for Herr von Lenbach, Munich." 3. "Large doors for the church of St. Anne, Munich." 4. "Fountain."

1363 Prof. Max Seliger * Leipzig * 1. "Crucifixus," design for mosaic decoration for the garnison church, Dresden. 2. "St. Michael," design for mosaic decoration for the garnison church, Dresden. 3. "Barbarossa," design for mosaic decoration for the Kaiser Wilhelm memorial church, Berlin.

1364 Richard Senf * München * "Competition design in perspective for a Girls' High School, Esslingen a. N."

Solf & Wichards * Berlin * "Wilhelmahaus, Berlin." 1365

Franz Thyriot * Berlin * 1. "The grand-ducal School of St. Augustine, Friedberg, Hesse (Gymnasium and Realschule)." 2. The same. 1366

Felix Reinhold Voretzsch * Dresden * "Dwelling house of Frau von Nostitz-Wallwitz, Lindengasse 14, Dresden." 1367

Kgl. Preussische Messbild-Anstalt * Berlin * "Fifty different enlargements of photographs of German buildings." 1368

Kgl. Preussisches Ministerium der öffentlichen Arbeiten * Berlin * Framed and glased water colour sketches: 1. "Gnadenkirche, Berlin," 2. "Railway station, Danzig." Framed without glass "Law courts, Berlin." Pictures in frames without glass, 1. "Exhibition of churches," 2. "Exhibition of Law courts." 1369

2. Single Groups.

(Palace of Varied Industries.)

Group 9.

Paintings and Drawings.

1372 Exhibits of the Vereins der Künstlerinnen und Kunstfreundinnen * Berlin * See p. 400, 401, 438, 440, 441, 456, 457, 461 and 467.

1373 Julius Bergmann * Karlsruhe * Oil-painting "Autumn Evening." See grp. 37 p. 454.

1374 J. V. Cissarz * Darmstadt * Wall paintings, drawings, easel pictures. See grps. 10 and 37 p. 399, 452 and 453.

1375 Prof. Fr. Fuhr * Karlsruhe * Distemper pictures "Interior," "On the bridge." See grp. 37 p. 453.

1376 Hans Heller * Darmstadt * Water colour paintings.

1377 Gustav Kampmann * Grötzingen b. Karlsruhe * Oil-painting "Railway at Evening." See grp. 37 p. 453.

1378 Valentin Mink * Darmstadt * Water colour paintings.

1379 Richard Schmidt * Darmstadt * Water colour paintings.

1380 Prof. G. Schönleber * Karlsruhe * Oil-painting: "Mouth of a harbour." See grp. 37 p. 453.

1381 Ansgar Schoppmeyer, Privatdozent * Schöneberg b. Berlin * Miniatures of the 4th—16th centuries. (Arts Building.) See grp. 15 p. 405.

Emilie Stephan * Karlsruhe * Oil-painting. See grp. 37 p. 454. 1381a

Walter Strich-Chapell * Karlsruhe * 2 Oil-paintings. See grp. 37 p. 454. 1381b

Helene Stromeyer * Karlsruhe * Oil-painting: Anemones. See grp. 37 p. 454. 1381c

Prof. Hans v. Volkmann * Karlsruhe * Oil-painting "Early Summer." See grp. 37 p. 453. 1382

Grete Waldau * Berlin * Wall-painting in Mines Building. 1383

Bertha Welte * Karlsruhe * Oil-painting. See grp. 37 p. 454. 1383a

Group 10.

Engravings and Lithographs.

Exhibits of the Vereins der Künstlerinnen und Kunstfreundinnen * Berlin * See above, p. 399, 401, 438, 440, 441, 456, 457, 461 and 467. 1384

J. V. Cissarz * Darmstadt * Etchings and lithographs. See grps. 9 and 37 p. 399, 452 and 453. 1385

Hans von Heider * Magdeburg * Lithographs and engravings. See grps. 14 and 37 p. 401 and 451. 1386

Worksshops of the Kunstgewerbeschule * Magdeburg * Lithographs. See grps 16 to 18 and 37 p. 411 and 451. 1387

Group 11.

Sculpture.

1388 Exhibits of the Hanau precious metal Industry * See p. 438 and 440.

1389 Exhibits of the Verein der Künstlerinnen und Kunstfreundinnen * Berlin * See p. 399, 401, 438, 440, 441, 456, 457, 461 and 467.

1390 Exhibits of the Vereinigten Werkstätten für Kunst im Handwerk, G. m. b. H. * München * See p. 401, 438, 440, 441, 448, 459 and 465.

1391 Eduard Beyrer * München-Gern * Bronze bust "Madonna" with wooden pedestal. See grps. 11 and 37 p. 396 and 447.

1392 Hermann Binz, Sculptor * Karlsruhe i. B. * Bronze statuette. See grp. 37 p. 446.

1393 Rud. Bosselt * Düsseldorf * Sculpture in wood and marble. See grp. 37 p. 448.

1394 Adolf Bredow, Sculptor * Stuttgart * Bronzes, bead moulding, Girl reading, sege vase, "Hermänndle" (statuette), silver ring bowl. See grp. 37 p. 455.

1395 Sophie Burger-Hartmann, Sculptor * Basel * Bronzes. See grps. 11, 31 and 37 p. 435, 436 and 447.

1396 Gerda Carré * München, Schellingstr. 92 * 2 bronze figures "The Dance."

1397 Fritz Christ, Sculptor * München * Bronzes. See grps. 11 and 37 p. 397, 435, 447, 448 and 453.

1398 Prof. Fridolin Dietsche * Karlsruhe * 2 wall fountains, bronze bas-relief (St. Cecilia), 1 bronze bust and statuette "Hans Jakob." See grps. 33 and 37 p. 442, 445 and 447.

1399 Nelly v. Eichler, Sculptor * München * Bronze: "Adam and Eve," Terracotta: "Dancing." See grp. 33 p. 442.

1400 Otto Feist * Karlsruhe i. B. * 2 statuettes and 1 portrait bust cast in bronze. See grp. 37 p. 446.

1401 Erhard Fischer, Sculptor in wood * München * 2 models of ships, 4 coats of arms of minstrel. Medal International Exposition Chicago, Medal German National Art Industry Exposition, München, 1 prize of the Bavarian Industrial Museum.

1402 Theodor von Gosen, Sculptor * München * Bronze statuettes. See grps. 11, 30, and 37 p. 435, 436 and 447.

1403 Dr. Greiner * Darmstadt * Sculptures. See grp. 37 p. 453.

1404 Prof. Ludwig Habich, Sculptor * Darmstadt * Sculptures. See grp. 37 p. 453.

1405 Prof. Wilh. Hahn, Sculptor * München * Bronzes. See grp. 37 p. 447.

1406 Johannes Hartmann, Sculptor * Leipzig, Leibnizstr. 26/28 * Marble bust of Robert Schumann. See grp. 37 p. 450.

1407 Joseph Hinterseher * München * "Wood idyl," groups for a fountain. See grp. 37 p. 447.

1408 Hugo Kaufmann * München * "Time," (decorated glock) and "Coquetry," bronzes. See grps. 11, 32 and 37 p. 436, 441 and 447.

1409 Karl Kiefer, Sculptor * München * Adalbertstr. 49 * Bronze. See grps. 11 and 37 p. 397 and 447.

1410 Emil Kiemlen, Sculptor * Stuttgart * Artistic bronzes. See grps. 11 and 37 p. 397 and 455.

1411 Prof. Max Klinger * Leipzig-Plagwitz * Marble busts of Richard Wagner and Franz Liszt. See grp. 37 p. 450.

1412 Georg Kolbe, Sculptor * Leipzig, Hardenbergstr. 32 * Marble bust of Johann Sebastian Bach. See grp. 37 p. 450.

1413 August Lucas, Wood carver * Düsseldorf * Cawings. See grp. 37 p. 448.

1414 Georg Mattes, Sculptor * München-Pasing * Bronze. See grp. 37.

1415 Rudolf Mayer, Professor at the Kunstgewerbeschule * Karlsruhe * Placques and medals, cast and stamped. See grp. 37 p. 446.

1416 B. Rudolph, Ivory carver * Stuttgart * Busts, figures, reliefs, vases and bowls in ivory. See grp. 37 p. 455.

1417 Prof. W. von Ruemann * München * Hermæ of Bismarck and Moltke. (German State Building) p. 360.

1418 Robert Schirmer, studio for sculpture * Berlin, Schaperstr. 32 * Ornamental and figure decorations of the Pottery Room and its façade. Models for ornamental sculpture. See grp. 37 p. 457.

See advertisements p. 30.

1419 Carl Schleusing, painter and carver in metals * Schöneberg, near Berlin * Relief in copper "H. I. M. Wilhelm II. Emperor of Germany and King of Prussia."

1420 Walther Schmarje * Schmargendorf, near Berlin * Plastics. See grp. 37 p. 451.

1421 Prof. Adolf Schmid * Pforzheim * Metal work (Bronze, silver and copper), placques. See grps. 30 and 37 p. 439 and 446.

1422 Daniel Stocker, Sculptor * Stuttgart * Studio for figure sculpture in bronze and marble. "Cain," "Kirke," and "Psyche," bronzes. See grp. 37 p. 456.

1423 Paul Sturm * Leipzig * Placques and medals with portraits or historical or allegorical subjects in bronze and silver. See grp. 37 p. 450.

1424 Artur Volkmann, Sculptor * Leipzig * Marble relief, "Orpheus and the beasts." See grp. 37 p. 450.

1425 Prof. Hermann Volz * Karlsruhe * Plastic. See grp. 37 p. 454.

1426 Albert Wiegel, Sculptor * Kassel * Crystal picture "Kaiser Friedrich borne to Valhalla"; relief in marble, "America."

Group 12.
Architecture.

1427 Prof. Herm. Billing * Karlsruhe i. B. * Architectural drawings, pen and ink drawings, and water colours (artistic architecture).

1428 Peter Birkenholz * München * Interior views of villa von Hesslin at Neu-Wittelsbach.

1429 Prof. Martin Dülfer * München * Designs for dwelling and country houses.

1430 Erdmann & Spindler * Berlin, Linkstrasse 29 * Architectural drawings, villas and mansions.

1431 Oswin Hempel * Dresden * Architectural drawings.

1432 Prof. W. Kreis * Dresden * Architectural designs.

1433 Friedrich Lahrs * Charlottenburg, Leibnizstr. 7 * Perspective drawing of the "Schleusengehöft" lock house at Klein-Machnow.

1434 Bruno Möhring * Berlin * Potsdamer Str. 109 * Architectural drawings, plaster model.

1435 Albin Müller * Magdeburg * Designs for countryhouses, and fitting up of interiors

1436 Prof. Joseph M. Olbrich * Darmstadt * Architectural drawings, by hand and printed, perspectives, &c.

1437 Gebrüder Rank * München * Garden fountain and entrance hall of a villa. Sketch for a country school house.

1438 Prof. Fritz Schumacher * Dresden * Architectural drawings.

1439 Prof. Emanuel Seidl * München * Six views of the "Augustinerbräu" building, Munich.

1440 Spalding & Grenander * Berlin, Prinz-Albrecht-Str. 7 * Coloured drawings of villa Kruse, at Hiddensee; perspective of exterior, and view of the entrance hall.

1441 Hermann Strübe, Artist * Karlsruhe * Sketches and designs for architecture and artistic industries.

Group 14.
Original objects of art workmanship.

1442 Exhibit of the Amber Industry. See p. 440, 441, 444 and 460.

1443 Exhibit of Vereins der Künstlerinnen und Kunstfreundinnen * Berlin * See p. 399, 400, 438, 440, 441, 456, 457, 461 and 467.

1444 Exhibit of Vereinigten Werkstätten für Kunst im Handwerk, G. m. b. H. * München * See p. 400, 438, 440, 441, 448, 459 and 465.

1445 Charles Bastian * Strassburg i. E. * Small table with tiles let into the top. See grp. 37 p. 454.

1446 Prof. Peter Behrens * Düsseldorf * Artistic outfit of the Catalogue of the German Imperial Exhibit at the World's Fair, St. Louis, 1904. See grps. 17 and 37 p. 411, 445 and 448.

1447 Frau Lilli Behrens * Düsseldorf * Coloured paper for book-binding. See grps. 17 and 37 p. 448.

1448 Emmy von Egidy * München * Useful articles in pottery. See grps. 30 and 31 p. 438 and 440.

1449 Fritz von Heider, Artist * Magdeburg * Vases, bowls, &c., in vitreous stone, ware, tiles. See grp. 37 p. 451.

1450 Hans von Heider * Magdeburg * Vitreous stoneware and lustrous porcelain. See grps. 10 and 37 p. 399 and 451.

1451 Rudolf von Heider, Sculptor * Elberfeld * Artistic pottery: busts, models of animals, vases, and useful articles. See grp. 45 p. 464.

1452 Georg Hulbe, Kunstgewerbliche Werkstatt für Lederarbeiten * Hamburg, Lindenstr. 43/46 * Artistic leather-work for the trade. See grps. 34 and 43 p. 444 and 462.

1453 Prof. C. Kornhas * Karlsruhe * Portrait busts: relief and pottery in delft and faience with lustrous glasing. Artist pottery in delft and porcelain. See grps. 37 and 45 p. 446 and 464.

1454 Kunststickereischule des Badischen Frauenvereins * Karlsruhe i. B. * Hand-woven carpet. See grps. 37, 43 and 58 p. 446, 462 and 468.

1455 Max Läuger, Artist and Architect, Professor at the Technischen Hochschule. Atelier für Innenausbau * Karlsruhe * "Professor Läuger's art-pottery." Vases, wall placques, mantelpieces, stoves, fountains, drinking basins for schools, reliefs for churches, &c. General manager, C. F. Otto Müller, Kaiser-

strasse 144, Karlsruhe i. B. See grps. 35 and 45 p. 446, 447, 448 and 465, and also in the model town.

1456 **Robert Macco, Kunstgewerbliche Werkstätten** * Heidelberg * Tarsias, inlaid jewel boxes, and showcases. See grp. 37 p. 446, 452 and 453.

1457 **W. Magnussen** * Bremen * Models, stoneware by Scharvogel, Munich, and delft by J. Uffrecht, Neuhaldensleben. See grp. 45 p. 465.

1458 **Jul. Müller-Salem, Teacher at the Kunstgewerbeschule** * Pforzheim * Metal work. See grps. 33 and 37 p. 443 and 446.

1459 **Hermann Mutz, Kunsttöpferei** * Altona a. E., Grüne Str. 19 * Useful and ornamental pottery of glased and coloured sharp-fire stoneware. See grp. 45 p. 465.

1460 **Oesterreich, Court bookbinder** * Dresden * Binding of the "golden Book" of the Dresden Municipality, designed by Professor O. Gussmann, Dresden. See grp. 37 p. 449.

1461 **Prof. B. Pankok** * Stuttgart * Cushion of woven silk. See grp. 37 p. 448 and 455.

1462 **Kurt Randhahn, Kunsttöpferei u. keram.-chem. Laboratorium** * Bunzlau (Sil.) and Eisenberg (S.-A.) * Ornamental articles of pottery in glased stoneware and clay.

1463 **Reichsdruckerei** * Berlin * Artistic bookbinding, exhibition articles, see grps. 15, 17 and 24 p. 404, 410 and 427. (Liberal Arts building.)

J. J. Scharvogel * München * Sharp-fire pottery. See grps. 14, 37 and 45 p. 436, 447, 448 and 465. 1464

Elisabeth Schmidt-Pecht * Konstanz * Art-pottery, painted and glazed clay, by J. Glatz, Villingen. See grp. 37 p. 447. 1465

Theo Schmuz-Baudiss, Artist and pottery maker * Charlottenburg * Underglazed work on porcelain. (Royal porcelain manufact., Berlin). See grp. 33 p. 436. 1466

Eduard Scholl Nachfl., Court bookbinder * Karlsruhe and Durlach * Artistic bookbinding. See grp. 37 p. 446. 1467

Rudolf Schwarz, Sculptor * München * Letterweight. See grp. 37 p. 447. 1468

Hermann Seidler, Artistic pottery maker * Konstanz * Useful and ornamental vases, &c., tiles, inlays and reliefs for house and church decoration, after original designs. 1469

Städtische gewerbliche Fortbildungsschule, weibliche Abteilung * Stuttgart * Art-pottery. See grp. 37 p. 456. 1470

Ernst Vollbehr, Artist * St. Heinrich am Starnberger See (Bayern) * Three hand-woven pieces "St. George," "The tree of knowledge," and "Sailing-ship," after Northern style. 1471

Franz Xaver Weinzierl, Leather expert * München * Studio for industrial art. Binding cut in cowskin. 1472

Werkstätten der Kunstgewerbeschule * Magdeburg * Vases and wall fountain See p. 465. 1473

Department C.
Liberal Arts.
Palace of Liberal Arts.

1. Joint exhibitions,
comprising several groups.
a) Exhibition of the German book-industry.
Groups 15 to 18.

Management: Deutscher Buchgewerbeverein Leipzig, Deutsches Buchgewerbehaus.
Artistic arrangement: Bruno Möhring, Architect, Berlin.

Group 15.

Typography.—Various printing processes.

1476 **Bauersche Giesserei** * Frankfurt a. M. * Founded 1851 * Branch type foundry in Barcelona (Suc. de J. de Neufville, Barcelona). Manufactures—type for text, headings and ornament, vignettes and borders from original designs of best artists. Brass lines. Specialities: capital types, &c., of original "Bauer" face. Export to all civilised countries.

1477 **Theodor Beyer, Kunstanstalt** * Dresden * Modern artistic placards (Room 40 of the Art Industry Palace).

1478 **H. Berthold, Messinglinienfabrik und Schriftgiesserei, A.-G.** * Berlin SW. 29 * Copies of original productions. Typometer on the Didot system. Branches in Stuttgart, St. Petersburg and Moscow.

1479 **Bibliographisches Institut (Meyer) in Leipzig, Branches in Berlin and Vienna** * Printing and publishing, type founding, stereotyping, electro-typing, chromo-lithography, map printing, and lithographic printing. Chief work published, Meyer's large Encyclopædia, Meyer's small Encyclopædia, Natural science, works geographies, histories of literature, Helmolt's history of the world, Woermann's history of art, Meyer's edition of classical authors, tourists guides, travellers guides, and glossaries, "Tägliche Rundschau." See grp. 17 p. 407.

1480 **Brühlsche Univ.-Buch- u. Steindruckerei, R. Lange** * Giessen * Founded 1828 * Three awards in Germany, one in America. Speciality commercial and artistic printing, Catalogues.

1481 **Bund der chemigraphischen Anstalten Deutschlands** * Berlin, Friedrichstr. 240 * Etchings and heliogravures in one or more colours. Exhibit in the German State Building. See p. 359, and grp. 16 p. 405.

1482 **Deutscher Buchgewerbeverein** * Leipzig * Collective exhibit, "Buchkunst und Kunst im Leben des Kindes." See grp. 17 p. 407.

1483 **Eckstein & Stähle, Kgl. Hofkunstanstalt** * Stuttgart * Chromolithography and lithographic printing. Speciality: highest class placards and series-maps, only made to order.

1484 **O. Felsing** * Berlin SW. * Copper printer to the Court. Monochrome engravings and etchings on plates of various material. Multi-chrome etchings German Patent 127,254. See grp. 16 p. 405.

1485 **Genzsch & Heyse, Schriftgiesserei** * Hamburg * Established 1833, Gold medal Paris 1900, first prize for printing type. Branch foundry at Munich; ware-houses and agencies in Paris, Barcelona, Lima, Santiago de Chile, and São Paulo. Seventy automatic and other casting machines, mostly of own construction and design. Engraving, printing, and electro-typing departments. Specimens exhibited of some well known registered original type-faces and ornaments designed by prominent artists (Heinz König, Otto Hupp, and others). Specimen books on show: 1. "Handprobe," containing all the firm's productions systematically arranged; title faces in "Small Fonts," American style. 2. "Muestario," spanish export catalogue. 3. Separate specimens: "Römische antiqua" (sold to the De Vinne Press of New York, Merrymount Press of Boston, and the matrices ceded to the Inland Type Foundry); "Klassische antiqua" (matrices ceded to the Keystone Type Foundry) "Schwabacher," "Neudeutsche," and many other Gothic and Roman faces. 4. Memoir of the Universal Type-lining system, first introduced into Germany by this house.

1486 **Herdersche Verlagsbuchhandlung** * Freiburg im Breisgau * See grp. 17 p. 408.

1487 **Wilhelm Hoffmann, Akt.-Ges., Kunstanstalt** * Dresden * Modern artistic placards by Unger, Fischer, Heilmann, Cissarz, Gussmann, and others, and eight reproductions in fac-simile from the work "Handzeichnungen neuerer Meister." "The hand drawings of modern masters" (Art Industry Palace, Room 40).

1488 **Heinr. Hoffmeister, Schriftgiesserei** * Leipzig * Pattern books and frames with type, vignettes and borders. Original productions a speciality. Awards Chicago 1893, Milan 1894, and Paris 1900.

1489 **Hollerbaum & Schmidt, G. m. b. H., Berliner Kunstanstalt für Buntdruck und Diaphanien** * Modern artistic placards (Art Industry Palace, Room 40).

1490 **Kast & Ehinger, G. m. b. H.** * Stuttgart * New York branch: Chas. Hellmuth, 46–48 East Houston St. Chicago branch: Chas. Hellmuth 357–359, St. Clark Street. All colours for the whole pictorial trade. See advertisements p. 18.

1491 **Maschinenfabrik Kempewerk** * Nürnberg * A special factory since 1882 for stereotyping, photo-engraving, racing machines and iron material for printing. German Patent on the first combined stereotype apparatus, in 1883, on the Widder stereotype apparatus with outlet for lead vapour, 1888, and on Combi's fittings for locking forms in 1898. Also protection on an improvement in Calander stereotypy, on Chemigraphy and construction of mechanical presses German Patent 1903 on drying matrices made of rag paper, patent applied for in 1904 on valve gas apparatuses for melting furnaces and type setting ma-

chines, stereotyping and the foundations of etching presses. Karl Kempe, the owner and founder of the works, is the inventor of the paper matrix plate—See Alex Waldow, Encyclopædia of the graphic arts—and the author of "Papier-Stereotypie" ten editions in 1904; was awarded the silver medal at Amsterdam in 1892 for services to the stereotypie and printing, and the gold medal of the North German Exhibition of Trade and Industry held at Lübeck in 1895, the gold medal of the first Russian Exhibition of Printing at St. Petersburg in 1895, and the diploma of the Russian Technical Association. The factory has branches in Berlin and Cöln. Exhibits: stereotyping and furniture casting apparatuses, paper matrices, lead alloys and milling machines for lead, zinc, brass and copper plates, facette materials, and a "Kosmos" rapid printing press and lastly "Die Papier-Stereotypie," 450 octavo pages, tenth edition in 1904.

1492 **Julius Klinkhardt, Printer and publisher, lithographic, xylographic and zincographic works, type-founder and book-binder** * Leipzig * Lithographic works for scientific purposes.

1493 **Köhler & Lippmann** * Braunschweig * Zylographic works. Wood cuts for technical industries.

1494 **G. Kreysing** * Leipzig * Printing in Oriental languages, (original types) Arabic, Sanscrit, Hebrew, Hindustani, Targumic, Assyrian, Sabaean, Cuniform, Ethiopian, Amharic, Hittite, Coptic, Pehlewe, and Armenian.

1495 **Dr. Löwinsohn & Co.** * Berlin-Friedrichsfelde * Black and coloured inks for all branches of printing. Prints in inks of own manufacture. Specialities: finest autotype colour inks, inks for three colour printing, guaranteed indeliable Export to all civilised countries.

1496 **Meissner & Buch** * Leipzig-London * Chromographic printing and publishing for artistic and commercial work. Art papers. See grp. 16 p. 406.

1497 **A. Molling & Comp., Comm.-Ges.** * Hannover * Lithographic art publishers. Speciality: Painting and picture books, illustrated postcards, cards of congratulation, fancy papers, posters and labels.

1498 **E. Nister** * Nürnberg * Fine art printer and publisher. Chromolithography, lithography, printing, etching, photogravure, copper plate printing, collotype, process blocks, line and half tone, chromotypogravure, wood engraving, letterpress printing, book-binding, and embossing. Speciality: Complete production of books of all kinds, juvenile books, calendars, congratulation cards, post cards, show cards and advertising novelties. Fine art decorations for burning into porcelain and earthenware. Established 1876. 750 workmen. Branch house in London. Representatives in America: for ceramic art decorations, Palm Fechteler & Co., 80 Fifth Avenue, New York—for all other productions, E. P. Dutton & Co., 31, West 23rd Street, New York. See grps. 16, 17 and 45 p. 406, 409 and 465.

1499 **Emil Pinkau & Co., Aktiengesellschaft** * Leipzig * Factory for lithography, photography and phototype works. Founded 1873. 19 machines for rapid printing, about 60 other machines, and 250 workmen. Awards at Chicago 1893, and Paris (silver medal) 1900. Exhibits: the making of photographic impressions directly on the stone with and without rests. All plates are lithographed. Postcards produced by phototypy.

1500 **Poeschel & Trepte, Buchdruckerei und Verlag** * Leipzig * Books and printed matter in plain and artistic styles. See grp. 17 p. 408.

1501 **Reichsdruckerei** * Berlin * Book-printing, lithography and copper plate in one or more colours, phototypy, heliography and other photo-mechanical processes, manufacture of banknotes and postage stamps and artistic watermarks. Established in 1879 by the union of the former Prussian Printing office with the "Geheime Ober-Hofbuchdruckerei" of R. von Decker. 1,724 hands (see special catalogue). See grps. 14, 17 and 24 p. 402, 410 and 427.

1502 **Josef Reinhart,** Xylographer of the Reichsdruckerei * Gross-Lichterfelde * Enormous wood cut.

1503 **Rudhard'sche Giesserei, Type foundry** * Offenbach a. M. * Type founding, chemigraphy, galvanoplastics, letterpress type and decorations in high class artistic and technical styles. First class artists continually employed. Exhibited: specimen books, pamphlets, and examples of types and ornaments, original drawings. See grp. 17 p. 408.

1504 **J. G. Schelter & Giesecke** * Leipzig * Founded 1819. 1,000 workmen. Type foundry, brass and wood cut factory. Department for acrography. Makers of numbering machines and others.

1505 **Arno Scheunert** * Leipzig * Artistic dies, seals, stamps for goods labels and show cards. Fancy labels.

1506 **Ansgar Schoppmeyer, Privatdozent** * Schöneberg near Berlin * For exhibit see grp. 9 p. 399.

1507 **Kunstverlagsanstalt und Verlagsbuchhandlung Gerhard Stalling** * Oldenburg i. Gr. * Founded 1789. Offices in Oldenburg and Berlin. The exhibit contains fine artistic hand-press engravings of German national pictures, offered by special desire of the German inhabitants of America at the much reduced price of $ 2 each. See grp. 16 p. 406.

1508 **Kunstanstalt Trowitzsch & Sohn** * Frankfurt a. O. * Phototypy in colours. Pictures reproduced to order. Also publishing office.

1509 **Vereinigung der Kunstfreunde, Kunstverlag** * Berlin * Phototypy in colours. See grp. 16 p. 406.

1510 **Friedr. Vieweg & Sohn** * Braunschweig * Printers, publishers, &c. Scientific works of all kinds, the exact sciences, particularly chemistry, physics, mathematics, anthropology, ethnography, medicine, hygiene, &c., chemical technology, industrial, farming, mechanics, machine construction, electro-technics, &c. See p. 394 and grps. 17 and 140 p. 408, 411 and 498.

1511 

Ernst Wasmuth, Architekturbuchhandlung und Kunstanstalten G. m. b. H. * Berlin * Founded 1871, limited company since 1903. Artistic plates and tables of architecture, sculpture, painting, the art trade, costumery, ornament and archeology. Printers and publishers of the collection of weavings at the Royal Art Industry Museum, Berlin; official publication at the instance of the Government of the Kingdom of Prussia. Publisher of the following periodicals: "Architecture of the twentieth century." "Architectural world of Berlin." "Town building." Own art departments for photography, lithography, stone printing and phototypy with hand and mechanical presses. Persons employed, artists, regular workmen and assistants, 150 persons. Fifteen prize medals. See grps. 16 and 17 p. 406 and 411.

1512 **J. J. Weber** * Leipzig * Printer and publisher, letterpress printing, xylography and galvanoplastics, illustrated papers, artistic wood-cuts, illustrated catechisms, portfolios, guide books for travellers, Universal cookery book. See p. 388 and grp. 17 p. 408 and 411.

Group 16.

Photography.

1513 **Aktien-Gesellschaft Aristophot** * Taucha-Leipzig und Berlin * Art departments for photo-mechanical printing, and all branches of graphic industry.

1514 **Ernst Bruckmann** * Heilbronn a. Neckar * Photographs in autotypy.

1515 **Bund der chemigraphischen Anstalten Deutschlands** * Berlin SW., Friedrichstr. 240 * Chromotype and black, also twofold autotype. See German State Building p. 309 and grp. 15 p. 453.

1516 **Elektro-Photochemische Industrie Berlin, G. m. b. H.** * Berlin * Photographs on sensitive woven textures, wood and leather. Copies on chloride and silver papers.

1517 **O. Felsing, Kupferdruckerei** * Berlin * Etchings in several colours by special patent process. See grp. 15 p. 403.

1518 **C. P. Goerz, Akt.-Ges. optische Anstalt** * Friedenau bei Berlin * Miethe's projection apparatus for coloured photography.

1519 **Hochstein & Weinberg** * Berlin * Founded 1873. Every kind of cardboard for printing, photography, bookbinding, fancy paper making, &c., mother of pearl paper, embossed paper, and ground printing paper for book covers, &c. Awards Berlin 1879, Sydney 1879, Melbourne 1880, and 1888, Porto Alegre 1881, Amsterdam 1884, Chicago 1893. First prizes. Export to all countries.

1520 **Jupiter, elektrophotographische Gesellschaft m. b. H.** * Frankfurt a. M., Rossmarkt 19 * Electric lighting apparatus for instantaneous photography, permitting exposure of $^1/_{30}$ of a second. German Imperial patent. 2 American patents. Awards Düsseldorf 1902, Mayence 1903.

1521 Meissner & Buch, Chromolithographische Kunstanstalt * Leipzig * Phototypy in one or more colours. See grp. 15 p. 404.

1522 Prof. Dr. Miethe * Charlottenburg * Complete Miethe apparatus for projection of natural coloured photograms.

1523 E. Nister, Kunstanstalt für graphische Reproduktionen * Nürnberg * Art prints, photogravures and photolithographs. See grps. 15, 17 and 45 p. 404, 409 and 465.

1524 Gerhard Stalling, Verlagsbuchhandlung * Oldenburg * Engravings. See grp. 15 p. 405.

1524a Dr. Franz Stoedtner * Berlin * Diapositives. See p. 359.

1525 Vereinigung der Kunstfreunde, Kunstverlag * Berlin * Coloured phototype. See grp. 15 p. 405.

1526 Verlagsanstalt F. Bruckmann, A.-G., Verlagsbuchhandlung * München * Autotypy. See grp. 17 p. 408 and 411.

1527 Ernst Wasmuth, Architekturverlag, Architekturbuchhandlung und Kunstanstalten G. m. b. H. * Berlin * For exhibits see grps. 15 and 17 p. 405 and 411.

Special group of professional and amateur photographs.

Management: Prof. Dr. Miethe * Berlin.

a) Professional photographs.

Management: F. Matthies-Masuren * Halle a. S.

1528 Jul. Benade, Hofphotograph * Erfurt.

1529 C. J. von Dühren * Berlin W., Mauerstrasse 61.

1530 R. Dührkoop * Hamburg, Ferdinandstrasse 43 * Workshop for modern realistic photographs in photogravure rubber and charcoal-print. Gold medals and highest awards: Baden-Baden, Berlin, Boston, Brussels, Hamburg, Hanover, Mainz, Magdeburg, Stuttgart, and Turin. Italian Royal State silver medal. Silver State medal of the Grand Duchy of Hesse.

1531 Erfurth * Dresden, Reissigerstr. 46.

1532 Fritz Ette, Atelier für Photographie * Eisleben, Bahnhofstr. 18 * Open air pictures (autotypes). "Childrens dance," "Two friends," "Two sunspots."

1533 G. Ferner & Sohn, Kgl. Bayer. Hofphotograph * Kaiserslautern, Pfalz * Kohledruck: "A sunbeam," "Girl with doves in the kitchen."

1534 Max Glauer * Oppeln O.-S., Krakauer Strasse 34.

1535 Albert Gottheil, Photographer * Danzig.

1536 Emil Gottheil * Königsberg i. Pr., Münzstrasse 6.

1537 Jakob Hartmann, Photogr. Atelier * Ludwigshafen a. Rh. * Portraits in rubber, autotype, and ozotypy. Awards Baden-Baden 1899 and Mainz 1903.

1538 Herrmann * Dortmund, Ostenthalweg 18.

1539 Hans Hildenbrand, Court photographer * Stuttgart.

1540 Hilsdorf, Photographer * Bingen a. Rh.

1541 Atelier Hülsen * Berlin NW., Dorotheenstrasse 72.

1542 Junior, Photographisches Atelier * Frankfurt a. M.

1543 Wilh. Knapp * Halle a. S., Mühlweg 19.

1544 Wilh. Kübeler * Darmstadt, Ludwigstrasse 16.

1545 Gebr. Lützel * München, Augustenstr. 16.

1546 Max Lusche * Hof i. B.

1547 Friedr. Müller, Court photographer * München, Amalienstrasse.

1548 Mart. Müller, Photographer * Blasewitz bei Dresden.

1549 Joh. Niclou, Photographer * Chemnitz.

1550 A. Pieperhoff, Photographer * Halle a. S.

1551 Jos. Raab, Photographer * Braunschweig.

1552 Arthur Ranft * Dresden, Augsburger Strasse 9.

1553 Erwin Raupp, Court photographer * Dresden, Prager Strasse.

1554 C. Ruf * Freiburg i. B. * Portraits: "Geheimer Rat Hegar," "An old man," "Frau Sch.," "Frau Forstrat W.," "A landscape."

1555 Rumbler, Photographer * Wiesbaden.

1556 Selke, Photosculpt-Ges. m. b. H. * Berlin * Photoplastics from life. American patent no. 667,251/706,459.

1557 Siemssen, Court photographer * Augsburg.

1558 Wilh. Weimer * Darmstadt, Dieburger Strasse.

1559 Gustav Werner * Leipzig, Zeitzer Strasse 16/18.

1560 Bruno Wiehr * Dresden, Reissigerstr. 46.

1561 Ed. Wolleschak * Naumburg a. S. * Autotype portrait. Awards Weimar 1901 and Dresden 1903.

b) Amateur Photography.

Manager: Franz Goerke * Berlin W., Maassenstr. 32.

1562 H. M. Carstensen * Flensburg.
1563 Dr. H. Engelken * Alt-Scherbitz.
1564 Otto Erhardt * Coswig-Dresden.
1565 W. Gesche * Hamburg.
1566 Franz Goerke * Berlin.
1567 Aura Hertwig * Charlottenburg.
1568 Dr. A. Kirstein * Berlin.
1569 Lette-Verein * Berlin.
1570 Max Lorenz * Klotzsche-Dresden.
1571 Peter Lüders * Hamburg.
1572 Dr. Mannheim * Berlin.
1573 Max May * Hamburg.
1574 Max Möller * Aachen.
1575 R. Proessdorf * Leipzig.
1576 Direktor Richter * Lipine.
1577 Gertrud Saupe * Berlin.
1578 Otto Scharf * Crefeld.
1579 Ernst Schatz * Breslau.
1580 Hedwig Schüssler * Berlin.
1580a Dr. G. Sieveking * Hamburg.
1580b E. Steidel * Berlin.
1580c S. Urff * Hanau.
1580d Ed. Weingärtner * Leipzig-Lindenau.
1580e Karl Winkel * Göttingen.
1580f M. Winkelmann * Berlin.
1580g Prof. Dr. O. Witt * Berlin.
1580h Aug. M. Vincenz Ziemens * Neustadt.

Group 17.

Books and publications.—Bookbinding.

1581 Bibliographisches Institut (Meyer), Verlagsbuchhandlung * Leipzig * For articles exhibited see grp. 15 p. 403.

1582 Breitkopf & Härtel * Leipzig * Book, art, and music publishers, Book-printing, lithography, and copper-plate printing, typefounding, electrotype, stereotyping, book-binding, lithography and music engraving * Original musical works. The only complete editions of the musical classics, Works dealing with the history of music, Popular edition of the classical and modern masters. Practical libraries for the home and the concert-room * Established 1719. Branches in Brussels, London, New York. 50 steam and 30 hand printing presses. 750 Employees.

1583 Deutsche Export-Revue, Office of * Berlin S. * Publishers of the "Deutsche Export-Revue", "The Export Review" and "Revista de la exportacion alemana". The only great German export newspapers. Published in 3 editions. 72 numbers annually. Proprietors: Deutsche Verlags-Anstalt (vorm. Ed. Hallberger) Berlin-Stuttgart. Founded 1848. 1000 workmen.

Deutscher Buchgewerbeverein * Leipzig * Founded 1884 * Highest award at Chicago 1893 and Turin 1902. Organ of the association "Archiv für Buchgewerbe" and supplements to the same displayed on the wall; 10th Volume of the Sample Exchange. Publications of the Association. For aims and objects of the Association see Introduction p. 157. See grp. 15 p. 403. 1584

Deutscher Buchgewerbeverein * Leipzig * Collective exhibit "Buchkunst und Kunst im Leben des Kindes" in which the 49 under-mentioned German firms participate. The exhibit includes artistically got up publications, picture books, juvenile books, book covers, job work, sample sheets from artistically got-up books, artistic lithographs, wood-cuts, title-pages, &c., and illustrates clearly the artistic capabilities of the modern German book-trade. Compare also exhibits in grp. 15 p. 402. Participators in the collective exhibit "Buchkunst und Kunst im Leben des Kindes": 1585

Bard, Marquardt & Co. G. m. b. H. * Berlin * Various well got-up books. 1586

Braun & Schneider * München * Wood-cuts, wood-cuts for illustration, children's picture books. 1587

Breitkopf & Härtel * Leipzig * Artistically gut-up music, incidental printed matter, ex-libris, original lithography, artistic mural decoration for school and home, title-pages. 1588

Breslauer & Meyer * Berlin * Börries Frhr. von Münchhausen, ballads. 1589

C. Busch du Fallois Söhne * Krefeld * Job work, mercantile lithographs, title pages. 1590

Georg D. W. Callwey * München * Books and separate Sheets from the "Kunstwart" undertaking. The German musician. Books for juveniles. 1591

S. Calvary & Co. * Berlin * Berthold Feiwel, Songs of the Ghetto, with illustrations by E. M. Lilien. 1592

J. G. Cotta'sche Buchhandlung Nachfolger G. m. b. H. * Stuttgart * Various books, book-covers. 1593

Eugen Diederichs * Leipzig * Artistically gut-up books, book-pages, and book-covers. 1594

1595 W. Drugulin, Buch- u. Kunstdruckerei * Leipzig * Marksteine der Weltliteratur and specimen pages of this work.

1596 Alphons Dürr * Leipzig * A number of juvenile books, with pictures by Oscar Pletsch and Ludwig Richter.

1597 S. Fischer, Verlag * Berlin * Books and book-covers.

1598 Fischer & Franke * Düsseldorf * Artistically got-up books, artistic drawings on stone (Original lithographs) for school and home.

1599 Genzsch & Heyse, Schriftgiesserei * Hamburg * Incidental printed matter produced from materials made in the type foundry. See grp. 15 p. 403.

1600 Heinrich Halfmann * Krefeld * Incidental printed matter. Exlibris.

1601 Harmonie, Verlagsgesellschaft für Literatur und Kunst * Berlin * Various books.

1602 Heinrichshofens Verlag * Magdeburg * Artistic headings for music.

1603 W. Heinsius Nachfolger * Leipzig * The Sermon on the mount. Dieffenbach, From childrens life. With illustration by Ludwig Richter.

1604 Georg Hirth, Verlag der Jugend * München * The art journal "Jugend" and title pages of this paper.

1605 G. A. Hohns Söhne * Krefeld * Rheinische Verlagsanstalt, well got-up books.

1606 Inselverlag * Leipzig * Artistically got-up books.

1607 Janke & Kästner * Leipzig * Wood-cuts for technical purposes.

1608 Alfred Janssen, Verlagsbuchhandlung * Hamburg * Various books published by himself.

1609 Paul Kittel * Berlin * Juvenile books.

1610 J. B. Kleinsche Buchdruckerei (M. Bucher) * Crefeld * Samples of job work and books.

1611 Alexander Koch * Darmstadt * Various art newspapers.
See advertisements p. 11.

1612 Albert Langen * München * Books, Book-covers, the journal "Simplicissimus" and back numbers of "Simplicissimus."

1613 F. A. Lattmann * Goslar * Job work. Börries Freiherr von Münchhausen, Juda, with illustrations by E. M. Lilien.

1614 Ferdinand Carl Löwes Verlag * Stuttgart * Juvenile books.

1615 Meyer & Seitz * München * Title-pages from designs by Otto Hupp in München.

1616 Heinrich Ochmann * Leipzig * Title-pages.

1617 Martin Oldenbourg, Verlag * Berlin * Döpler-Ranisch, Walhalla, The Gods of the Teutons. Schumacher-Kessler, Life of Jesus.

1618 Poeschel & Trepte * Leipzig * Incidental printed matter, exlibris and title-pages. See grp. 15 p. 404.

1619 Rudhardsche Giesserei * Offenbach a. M. * Incidental printed matter produced with original material made in the foundry. See grp. 15 p. 404.

1620 Schafstein & Co. * Köln a. Rh. * Artistically got-up juvenile and picture books.

1621 B. Schotts Söhne * Mainz * Song-book for children.

1622 Schuster & Löffler * Berlin * Various well got-up books published by the firm.

1623 E. A. Seemann * Leipzig * Original etchings, original wood-cuts.

1624 Julius Sittenfeld * Berlin * Memorial and artistic Calenders.

1625 J. A. Stargardt * Berlin * Various books.

1626 B. G. Teubner * Leipzig * Books, Artistic mural Dekoration (Drawings on stone by artists) for school and home.

1627 Velhagen & Klasing * Bielefeld und Leipzig * Reinicke Fox, Fairy Tales, Song and Story Book. Illustrated with wood-cuts.

1628 Verlagsanstalt F. Bruckmann, Akt.-Ges. * München * Various books, book-covers. See grp. 16 p. 406 and 411.

1629 Deutsche Verlagsanstalt * Stuttgart * Several juvenile books.

1630 Allgemeine Verlagsgesellschaft m. b. H. * München * Various books.

1631 Friedr. Vieweg & Sohn * Braunschweig * Wood-cuts for anatomical, technical and scientific purposes. See grps. 15 and 140 p. 405, 411 and 498.

1632 R. Voigtländer * Leipzig * Books, artistic mural Decoration (Drawings on stone by artists) for school and home.

1633 J. J. Weber * Leipzig * Books, wood-cuts for illustrations. See grp. 15 p. 405, 411.

1634 Georg Wiegand * Leipzig * Juvenile books.

1635 **Wilhelm Diebener** * Leipzig * Verlagsbuchhandlung. 1 copy of the book: "Monogramme und Dekorationen für Uhren- u. Edelmetallgravierung" which has been published in 3 languages.

1636 **Freier Verlag, G. m. b. H.** * Berlin * Books.

1637 **F. C. Glaser** * Berlin SW., Lindenstr. 80 * Patent- u. techn. Bur. Publisher of the periodical "Glasers Annal. f. Gew. u. Bauw." * 10 vols. of this periodical and 2 books (copyright).

1638 **Julius Groos, Verlagsbuchhandlung** * Heidelberg * Founded 1804. Text-books, for Germans and foreigners, for acquiring modern languages according to the Gaspey-Otto-Sauer method. 200 vols. Comprising the following 20 languages: Arabian, Armenian, Chinese, Danish, English, French, Italian, Japanese, modern Greek, Dutch, Persian, Polish, Portuguese, Roumanian, Swedish, Spanish, Suahili, Turkish, Hungarian. Depots in New York, London, Paris, Rome, St. Petersburg, Madrid, Constantinople, &c. Annual sale about 150,000 volumes to all parts of the world.

1639 **G. Grote'sche Verlagsbuchhandlung** * Berlin SW. * Works on the history of art, belles lettres, pedagogy, etchings, colored wood-cuts.

1640 **"Harmonie," Verlagsgesellschaft** * Berlin * Prof. Reimann's illustr. biography of musicians (Paris 1900 awarded) 15 vols. Gay music (Überbrettl, farces).

1641 **Herdersche Verlagshandlung** * Freiburg im Breisgau * Founded 1801. Publishers, printers, book-binders. Branches at Strassburg, München, Vienna, and St. Louis, Mo. Employing altogether about 500 persons. Large publishing business of books in German and foreign languages, especially bearing on catholic theology, pedagogy, belles lettres, social and political science, history, natural science, art and archæology, encyclopædia. About 200 works annually. See grp. 15 p. 403.

1642 **Bruno Hessling, G. m. b. H. Verlagsbuchhandlung** * Berlin * Publication of works treating of architecture and industrial art.

1643 **Carl Heymanns Verlag. Rechtswissenschaftl. Verlagshandlung** * Berlin W. 8 * Publications of the Imperial Patent Office.—Works on subjects connected with the promotion of the social welfare of the people.—The Imperial Journal of Work.

1644 **Gebrüder Hug & Co.** Gegr. 1807 * Leipzig, Zürich, Basel, Strassburg i. Els., St. Gallen, Luzern, Konstanz, Winterthur * Music publishers, general booksellers, export.

1645 **Heinrich Keller** * Frankfurt a. M. * Bookseller. Works on architecture, applied art, the history of art, costumes and heraldry. Publisher and general bookseller.

1646 **Gerhard Kühtmann, Verlagsbuchhandl.** * Dresden * Established 1887. Publisher of books on architecture, art and applied art, technics and mathematics, trade and handicrafts.

1647 **Langenscheidtsche Verlagsbuchhandlung und Buchdruckerei (Prof. G. Langenscheidt)** * Berlin SW. 11 * Hallesche Strasse 17. Established 1856. Representative in St. Louis: B. Herder, 17 South Broadway. I. Aids to the study of modern languages: 1. Letters instructing according to the Toussaint-Langenscheidt method in all civilised languages. 2. Encyclopædic dictionaries: Sachs-Villatte (French), Muret-Sanders (English), large and small edition, and Langenscheidt's pocket dictionaries and encyclopædies for all modern languages. 3. Histories of literature. 4. Vocabularies. 5. School grammars and various other aids. 6. Journal of the German Shakespeare Society. II. Library of German translations of Greek and Roman classics. 110 vols.

1648 **Fritz Lehmanns Verlag, Verlagsbuchhandlung** * Stuttgart * Books and separate sheets.

1649 **Ernst Morgenstern** * Berlin * Vol. 8 and 9 of the "Deutscher Buch- und Steindrucker," central organ of the German graphic trades.

1650 **E. Nister, Kunstanstalt für graphische Reproduktionen** * Nürnberg * For Exhibits see grps. 15 and 16 p. 404, 406 and 465.

1651 **Hermann Paetel, Verlagsbuchhandlung** * Berlin, Elssholzstr. 12 * Proprietor Kommerzienrat Dr. Hermann Paetel und Alfred Paetel. Publications of the Allgemeinen Vereins für deutsche Literatur. Periodicals: Asien and Himmel und Erde. Colonial guide, Export guide, and other works.

1652 **Friedrich Pustet** * Regensburg * Verlagsbuchhandlung mit Buchdruckerei, Buchbinderei usw. The latest editions

of liturgical books printed in red and black letters, richly illustrated in appropriate original bindings. Hymn Books. Prize medals at Chicago 1893 and at many Exhibitions. Branches in Rome, New York and Cincinnati, O.

1653 **Reichsdruckerei** * Berlin * For Exhibits see grps. 14, 15 and 24 p. 402, 404 and 427.

1654 **Dietrich Reimer (Ernst Vohsen), Verlagsbuchhandlung** * Berlin SW., Wilhelmstrasse 29 * Publications: Books and maps. See grp. 18 p. 411 and 489.

1655 **L. Schottlaender & Co.** * Berlin, Kurstrasse 43/44 * Exhibit: Export number of the "Confectionair," the most widely circulated German organ for all articles suitable for Export. Sample number gratis.

1656 **Wilhelm Schultz, Chefredakteur** * Berlin * Books.

1657 **Otto Spamer** * Leipzig * Verlagsbuchhandlung. Popular scientific works, Publications for instruction and entertainment, juvenile publications for all ages.

1658 **B. G. Teubner** * Leipzig * Verlagsbuchhandlung und Buchdruckerei. Establ. 1811. Publishes works on philology, mathematics, natural science, technics, modern languages and pedagogy; schoolbooks and drawings on stone by artists. Full report and special catalogues sent gratis on application.

1659 **Velhagen & Klasing in Bielefeld und Leipzig** * Verlagshandlung. Established 1835. Illustrated printed works, illustrated reviews, school-books and maps. Awards: Düsseldorf 1880 silver medal, Leipzig 1897 gold medal, Paris 1900 gold medal, Düsseldorf 1902 gold medal. See grp. 18 p. 411.

1659a **Verein der deutschen Musikalienhändler** * Leipzig * Music of all kinds in portfolios and bound volumes as a collective exhibit under the designation:

German Musical Exhibition,

in which the following Music Publishers participate:

1660 Johann André * Offenbach a. M.
1661 A. Auer * Stuttgart.
1662 M. P. Belaieff * Leipzig.
1663 A. J. Benjamin * Hamburg.
1664 R. Bertram * Leipzig.
1665 A. Böhm & Sohn * Augsburg.
1666 Ed. Bote & G. Bock * Berlin.
1667 Adolf Brauer * Dresden.
1668 Breitkopf & Härtel * Leipzig.
1669 Max Brockhaus * Leipzig.
1670 Buchhandlung des Traktathauses * Bremen.
1671 Carisch & Jänichen * Mailand.
1672 J. G. Cotta'sche Buchhandlung * Stuttgart.
1673 Wilhelm Dietrich * Leipzig.
1674 Ernst Eulenburg * Leipzig.
1675 B. Firnberg * Frankfurt a. M.
1676 A. C. Fischer * Bremen.
1677 Rob. Forberg * Leipzig.
1678 Phil. Fries * Zürich.
1679 Ad. Fürstner * Berlin.
1680 Fritz Gleichauf * Regensburg.
1681 W. Groscurth * Berlin.
1682 Julius Hainauer * Breslau.
1683 Harmonie * Berlin.
1684 Heinrichshofens Musikverlag * Magdeburg.
1685 H. Hinz * Altona.
1686 L. Hoffarth * Dresden.
1687 Friedr. Hofmeister * Leipzig.
1688 Gebr. Hug & Co. * Leipzig.
1689 Otto Junne * Leipzig.
1690 C. F. Kahnt Nachfolger * Leipzig.
1691 Fr. Kistner * Leipzig.
1692 Edgar Kramer-Bangart * Kassel.
1693 F. C. C. Leuckart * Leipzig.
1694 Friedrich Luckhardt * Leipzig.
1695 Luckhardt's Musikverlag (R. Lebrecht) * Stuttgart.
1696 Musikhaus zum Franz Liszt (R. Volkmann) * Weimar.
1697 Louis Oertel * Hannover.
1698 C. F. Peters * Leipzig.
1699 H. Preiser * Liegnitz.
1700 D. Rahter * Leipzig.
1701 Alb. Rathke * Magdeburg.
1702 Gebrüder Reinecke * Leipzig.
1703 Rozsavölgyi & Co. * Budapest.
1704 Carl Rühle * Leipzig.
1705 Schlesinger'sche Buch- und Musikhandlung * Berlin.
1706 C. F. Schmidt * Heilbronn a. N.
1707 Max Schmitz * Leipzig.
1708 Walther Schröder * Berlin.
1709 H. Schroeder Nachf. * Berlin.
1710 Fritz Schuberth jr. * Leipzig.
1711 J. Schuberth & Co. * Leipzig.

1712 Schuster & Löffler * Berlin.
1713 Schweers & Haake * Bremen.
1714 Bartholf Senff * Leipzig.
1715 C. F. W. Siegel's Musikh. (R. Linnemann) * Leipzig.
1716 N. Simrock, G. m. b. H. * Berlin.
1717 Süddeutscher Musikverlag * Strassburg i. E.
1718 W. Sulzbach * Berlin.
1719 Chr. Fr. Vieweg * Berlin.
1720 Henry Vries * Cöln a. Rh.
1721 Julius Weiss * Berlin.
1722 Jul. Heinr. Zimmermann * Leipzig.
1723 Musik-Woche * Leipzig * Modern illustrated musical newspaper with numerous supplements. Cheap Collections of music for piano, violin and singing.
1724 Verlag des Deutschen Reichs-Adressbuchs, G. m. b. H. * Berlin SW. 19 * The German Imperial Directory for Industry, Trade, and Commerce. 2 Vols. 30 Marks. Medal awarded Paris 1900.
1725 Verlagsanstalt F. Bruckmann A.-G. in München * Publishers of Publications relating to art and the history of art and establishment for reproductions monumental works on antique sculpture, Greek vase painting, the architecture of the Renaissance. Publications referring to galleries. Illustrations for school walls. See grp. 16 p. 406 and 408.
1726 Friedrich Vieweg & Sohn, Verlagsbuchhandlung und Buchdruckerei * Braunschweig * Book, periodicals, Reviews. See grps. 15, 16 and 140 p. 405, 408 and 498.
1726a F. Volckmar, Sortimentsbuchhandlung * Leipzig * Library in the Reading Room of the German State Building. See p. 360.
1727 Ernst Wasmuth, Architekturverlag, Architekturbuchhandlung und Kunstanstalten, G. m. b. H. * Berlin * For Exhibits see grps. 15 and 16 p. 405 and 406.
1728 J. J. Weber, Verlagsbuchhandlung, Buchdruckerei, Galvanoplastische Anstalt, Stereotypie, Xylographische Anstalt * Leipzig * For Exhibits see grp. 15 p. 405 and 408.

1729 Prof. Peter Behrens * Düsseldorf * Artistic get up of the Official Catalogue of the German Empire for the Great Exhibition at St. Louis 1904. See grps. 14 and 37 p. 401, 445 and 448.

Group 18.

Maps and apparatus for Geography, Cosmography and Topography.

1730 Justus Perthes, Geographische Anstalt * Gotha * Maps and Atlases.
1731 Dietrich Reimer (Ernst Vohsen), Verlagsbuchhandlung * Berlin SW. 48, Wilhelmstr. 29 * Publishers; maps, charts, globes. See grp. 17 p. 410.
1732 Velhagen & Klasing, Verlagsbuchhandlung und Geographische Anstalt * Bielefeld und Leipzig * For Exhibits see grp. 17 p. 410.

b) Exhibit by German Municipalities. Groups 25, 26 and 27.

See Education and Social Economy p. 381 and 502.

2. Single Groups.

Groups 16, 17 and 18.

a) German Colonial Exhibits.

See Agriculture p. 488.

1745 Kolonialwirtschaftliches Komitee * Berlin, Unter den Linden 40 * Colonial maps and Publications.
1746 A. Krüss, Opt. Institut * Hamburg, Adolfsbrücke 7 * Photographs by Dr. Uhlig.
1747 Justus Perthes * Gotha * Map of the Protectorate of German East Africa.
1748 Dietrich Reimer (Ernst Vohsen) * Berlin SW., Wilhelmstr. 29 * Works and Maps of German East Africa.
1749 C. G. Schillings * Gürzenich-Düren * Instantaneous photos of wild animals in their native element with Goerz apparatuses.

b) Single Exhibitors.

1750 J. Littauer, Kunstsalon * München * Reproductions.
1751 Werkstätten der Kunstgewerbeschule * Magdeburg * Printed matter. See grps. 10 and 37 p. 399 and 451.

1752 A. Wohlfeldt, Buch- und Kunstdruckerei * Printing the Explanatory Report for the Magdeburg Room. See grp. 37 p. 451.

Group 19.

Instruments of precision, physical Apparatus, &c.

German Education Exhibition Scientific Instruments Section (mechanics and optics) in the Educational Building.

(See Education p. 363, 373.)

1753 Carl Bamberg, Werkstätten für Präzisionsmechanik und Optik * Friedenau bei Berlin * Astronomical, geodetical, terrestrial magnetic, and nautical instruments. Glass ground on the premises.

1754 Georg Bartels * Göttingen * Electrometers and seismometers.

1755 Max Bekel * Hamburg-Barmbeck, Elsassstr. 39 * Balances.

1756 Hugo Bieling * Steglitz b. Berlin, Florastrasse 2 * Instruments of precision.

1757 J. & A. Bosch, Konstrukteure und Mechaniker * Strassburg i. E. * Established 1889. Manufacturer of Seismometers, meteorological instruments, precision balances and weights.

1758 R. Brunnée (vorm. Voigt & Hochgesang) * Göttingen * Polarisation and chemical microscopes. Collections of thinly-ground stones and minerals important from a petrographic point of view.

1759 Paul Bunge * Hamburg, Ottostr. 13 * Balances.

1760 Reinhold Burger * Berlin N. 4, Chausseestr. 2 E * Manufacturer of scientific glass apparatus and instruments of precision.

1761 Arth. Burkhardt, Ing. * Glashütte (S.) * 1st German Calculating machines for all kinds of calculations. Awarded 15 First Prizes. Established 1878.

1762 Continental-Caoutchouc & Gutta-Percha Co. * Hannover * India-rubber balloons. See grp. 72 p. 473.

1763 Dreyer, Rosenkranz & Droop * Hannover * Manufacturers of armatures for boilers and machines, indicators and water-meters for municipal Water-supply. See advertisements p. 10.

1764 M. Fechner, Institutsmechaniker d. Kgl. geodätischen Instituts * Potsdam * Geodetic instruments.

1765 R. Fuess * Steglitz bei Berlin * Section I, optical, physical and mineralogical instruments. Sect. II meteorological-apparatuses. Sect. III Seibt-Fuess Hydrotechnical instruments.

1766 F. O. R. Goetze * Leipzig * Factory for glass instruments, founded 1876. Beckmann apparatuses. Precision thermometers. Spectral tubes of own construction (registered in Germany and patented in England) Prof. Dr. Dorn of Halle is of the opinion that these tubes give an extremely clear and many lined spectrum.

1767 Ephraim Greiner, Glasinstrumente-, Apparate- und Gerätefabrik * Stützerbach (Thüringen) * Manufacture and export of hydrometers for every purpose, barometers, thermometers for scientific or technical use, graduated measuring glasses, gauged and now-gauged, instruments and appliances of every sort for chemical and physical laboratories, dispensaries factories, &c. Founded 1868, numerous patents. Quality prizes and chief awards: Brussels 1888, Chicago 1893 and Erfurt 1894.

1768 Günther & Tegetmeyer * Braunschweig, Höfenstr. 12 * Apparatuses for measurement of electricity in the air.

1769 Emil Gundelach * Gehlberg i. Thür. * Glass works with regenerative gas furnace. Workshop for glassblowing with special gasworks. Workshops for grinding and cutting, as also for smiths and carpenters with electric power. Founded 1852. Makes all appliances and instruments of glass for scientific uses. A number of vacuum tubes at work in special camera obscura. Further Röntgen tubes, Dewar vessels for liquid air and glass apparatuses for physical purposes.

Trade Mark

1770 B. Halle * Steglitz-Berlin * Optical productions for polarization. Method of manufacture of Nicol prisms and cutting machine (original invention). Founded 1873. Awards: Brussels, Chicago, Paris.

1771 Hartmann & Braun, A.-G. * Frankfurt a. M. * 150 officials, 250 workmen. Factory of electric measuring instruments and apparatuses for science and industry. Complete equipments for electric laboratories and testrooms.

galvanometer, standard resistance coils, &c., bridges, precision resistance coils, &c., standard inductors and cells, Bismuth coils, iron testers, photometers, ampère meters, pointing and registering, voltmeters, wattmeters, ohmmeters. Further thermometers and pyrometers for use in Laboratories and at switchboards, apparatuses for measuring insulations and locating of defects, complete cable scales. Electrometers. Materials for installations, Peschel's system.

1772 **A. Hasemann** * Berlin * Mechanische Werkstatt. Founded 1849. Instrument for measuring the position of scale tongues in the metrical system. Precision scales.

1773 **Hans Hauswaldt, Dr. phil. h. c.** * Magdeburg-Neustadt * Representation of interference in polarised light on 2 double plates and 2 prints; the latter printed in 300 copies and placed gratis at the disposal of universities and scholars.

1774 **H. Heele** * Berlin O., Grüner Weg 104 * Scientific precision instruments.

1775 **W. C. Heraeus** * Hanau * Established 1851. Representative: Charles Engelhard, New York, 41, Cortlandt Street. Platinum composition. Manufacture of platinum, fine silver and aluminium apparatus. Aluminium welding process patented in most civilised countries. Own workshops for utensils. Mountain crystal (Quartz-glass); Quartz-glass mercury lamp for producing ultra violet rays, patented. Manufacture of electric laboratory stoves. About 500 supplied during 2 years. Holborn & Wiens pyrometer for temperatures up to 1600° C. Several thousand in use. Manufacture of gold leaf, silver leaf and lustre colours. Employ 5 chemists, 35 officials and 100 workmen. Chicago 1893 Award: Paris 1900, Grand Prix.

1776 **H. Hommel** * Mainz * Fabrik Idarwerk Oberstein. Precision tools for measuring standard controllers and for use in workshops as a means of exact adjustment and uniform measurements. Awards: Board of workmen, Saarbrücken 1903, gold medal. Industrial and Trade Exposition, Düsseldorf 1902, silver medal. Paris 1900, gold medal.

1777 **Junkers & Co.** * Dessau, Filialfabrik Rheydt * Patented in all civilised countries. Awards: Chicago 1893, Leipzig 1897, München 1899, Berlin 1899, Paris 1900, Düsseldorf 1902. Export to all civilised countries. Special Manufactury of Prof. Junkers' apparatuses for determining heating power of gases and liquids, for hot water supply and gas heating. Exhibits: Prof. Junkers' calorimeter for rapid certain and lasting determination of heating power of gaseous and liquid fuel; Prof. Junkers' automatic calorimeter, showing the heating value automatically. Prof. Junkers' gauger for gasometers, &c. See special catalogue of German exhibition of education.

Max Kohl * Chemnitz in Sachsen * Physical and chemical instruments for scientific researches and demonstrations. Röntgen appliances and appliances for physical and chemical laboratories and auditorium. Largest establishment of the kind on the continent. Exhibition of instruments for science and demonstration in department "Scientific Instruments" of German exhibition for Education. Fittings of lecture hall of Education Exhibition supplied by special request of Government Commission: skylight shutter, Panneau's experimenting table with modern equipment. 270 workmen, 32 officials. Chicago 2 Prizes, Paris 1900 gold medal. 1778

Königliches Aeronautisches Observatorium bei Berlin * Exploration of upper air regions. 5 kites, model of kite balloon system Parseval-Sigsfeld, rubberballoons, cables and steelwires. Registering apparatuses for kites and rubberballoons, accessory apparatuses, model of cable winder. Publications, 12 tables of curves, temperature above Berlin in 1903. 1779

A. Krüss, Optisches Institut * Hamburg * Proprietor Dr. Hugo Krüss. Founded 1796. Spectral apparatuses, Photometers, Hefner lamps, Projection apparatuses. 1780

E. Leitz, Optisch-mechanische Werkstätte in Wetzlar (Deutschland). * Branches: Berlin, Luisenstr. 45; New York, 411 West 59th Str.; Chicago, 32–38 Clark Str. 1781

Leppin & Masche, Fabrik wissenschaftl. Instrumente * Berlin SO. * Speciality: Physical apparatuses for demonstration, for universities high schools, &c. See German exhibition of education. 1782

Friedrich Lux * Ludwigshafen * Speed indicators. See p. 365 and 373 and grps. 23 and 64 p. 422 and 471. 1783

1784 **A. Mensing** * Berlin * Apparatuses for physical exploration of the sea. Deep sea watermark (practically tried apparatus for registring course of tides during 30 days).

1785 **Prof. Dr. Miethe** * Charlottenburg * Projection apparatus for three colours.

1786 **J. D. Möller** * Wedel i. H. * Founded 1864. Universum Diatomacearum Möllerianum with 4,026 Diat., 72 Diat. Type plates. Photographic micrometre and pigeon post messages. Glass silvering with reflexion of 96 per cent. Optical works of precision.

1787 **Richard Müller-Uri** * Braunschweig * Glass technical works of precision. Apparatuses for chemistry and physics. Founded 1894. Paris 1900 silver medal.

1788 **W. Niehls** * Berlin N. * Royal Prussian medal. Gold medal Paris 1900. Mercury therm. +583° C. therm. −200° C. Tempering scale for glass. Glass taps. Testers for mineral oils. Metal therm. for instructional purposes.

1789 **Kaiserliche Normal-Eichungskommission** * Charlottenburg * Precision scales for 25 kgs with weights, Photographs.

1790 **J. Peters** * Berlin NW., Turmstr. 4 * Apparatuses for polarisation, spectroscopes, calorimeters. Founded 1894. Last award: Paris 1900 Grand Prix.

1791 **Physikalisch-Technische Reichsanstalt** * Charlottenburg * Scientific apparatuses and photographs.

1792 **C. Richter** * Berlin N., Johannisstr. 14/15 * Thermometers.

1793 **A. Riedinger** * Augsburg * Model of kiteballoon.

1794 **Clemens Riefler** * München * a) Mathematical precision instruments and instruments for technical drawing. Precision compasses, round system introduced by the firm. Precision drawing pens with tongue opening sideways, fountain drawing pens, compasses for maps and distances, prolongable compasses, punctuating apparatuses of the newest, protected system. Ruling apparatuses, Ellipsographs, &c. b) Astronomical clocks with entirely free check, ditto with electric lift, regulating pendulum of nickel and steel, patented system Dr. S. Riefler. — 5 workshops, 100 workmen. Annual production about 160,000 instruments. 24 prize medals. Paris 1900 Grand Prix. Export to all countries. — Proprietor of firm: Dr. S. Riefler, Engineer in Munich, Adolf Riefler, Kommerzienrat in Nesselwang. Theodor Riefler, Manufacturer in Nesselwang.

Th. Rosenberg * Berlin N. * Factory of geodetical instruments, theodolites, nivelling instruments, compasses, telescopic graphometers and plane tables, &c. Paris 1900 gold medal. 1795

Schäffer & Budenberg * Magdeburg-Buckau * Hydraulic pressure pumps with 4 manometers. See p. 373 and grps. 62 and 64 p. 470 and 471. 1796

Franz Schmidt & Haensch, Optisch-mechanische Werkstätten * Berlin S. 42 * Spectral apparatuses, polarisation and projection apparatuses, photometers, colorimeters and other scientific instruments, exhibited in the Departments: "Scientific instruments," "Chemical Industry," "Education," "Imperial Board of Health." 1797

G. Schoenner, Reisszeugfabrik * Nürnberg * First factory in this line. Founded 1851. Highest prizes awarded. 400 workmen. Many automatic special machines in use. Latest achievements are: Straightening device for compass handles. Patent lever for cleaning ruling pen, preserving the width of line exactly. Patented regulation by micrometer for adjusting the needle point of compasses. Improvement of joint-motion superior to the former pivot-joint. 1798

Louis Schopper * Leipzig, Arndtstr. 27 * Balances. 1799

Schott & Genossen * Jena * Glassworks, founded in 1884 by aid of the Roy. Pruss. Government * Scientific and technical glasses, the latter as far as they are superior to those on the general market. Optical plate glass, large reflexion prisms, discs for telescope objectives; glasses transparent for ultra violet rays. Optical stained glass, tubes for thermometers, watergauge, glasses for laboratories, chimneys for incandescent light, petroleum and mining lamps. 600—700 workmen and officials. Award medal, Chicago 1893. Grand Prix, Paris 1900. 1800

G. A. Schultze * Berlin * Technical measuring instruments. Founded 1850. Awards at many exhibitions. Analyser for smoke gas, U. S. A. Patent, distance thermometers, air speed recorder for blast-engines, guaged thermo-areometers, standard thermometers. 1801

1802 **Dr. Siebert & Kühn** * Kassel * Manufactury of glass precision instruments, speciality: Standard thermometer, from −200° to +575° C, vessels and thermometers up to 750° C of molten pebble-crystal.

1803 **Siemens & Halske** * Department: "Scientific instruments." Complete measuring outfits: for resistances of every kind, for current and voltage (with compensation apparatus), for determining the quality of iron, for determining constants of inductions and energy losses in alternating current instruments. Electrical measuring instruments of every description for laboratory and switchboard use. Instruments for pyrometrical measurements. Compass. See p. 374, 376 and 379 and grps. 26, 74 and 141 p. 428, 473 and 500.

1804 **Sommer & Runge** * Berlin * Workshops for fine mechanics. Exhibits: Dividing machine, at the same time comparator with 1 m spindle thread, two nuts, easily changeable, and two microscopes. Direct reading of 0·001 mm.

1805 **Wilh. Spoerhase vorm. C. Staudinger & Co.** * Giessen * Manufacturers of fine balances.

1806 **P. Stückrath** * Friedenau b. Berlin, Albestr. 11 * Balances.

1807 **Ludwig Tesdorpf** * Stuttgart * Manufactury of all instruments for astronomy and geodesy; passage instruments, universals, theodolites, levelling instruments, tachymeters, crocidolites, military distance measures, precision indicators; awards: Chicago 1893, Lübeck 1895, Paris 1900, &c.

1808 **Otto Toepfer & Sohn** * Potsdam * Workshop for scientific instruments, founded 1873. Grand Prix Paris 1900. Astrophysical and terrestrial magnetic instruments, registering arrangements, microscopes, measuring instruments.

1809 **J. Wanschaff Sohn** * Berlin * Workshop for scientific instruments of astronomy, geodesy, physics and navigation. Founded 1876. Chief production: Instruments with microscopic reading, necessitating most exact sectioning of circle. Large first class spectrometer with 8 inch circle and direct microscopic reading of 1 sec.; equiped completely for all measurements. Universal instrument with circles of 14·5 cm (5½ inch.) diameter and direct microscopic reading of 10 sec. See advertisements p. 26.

1810 **Prof. Dr. Max Wolf** * Heidelberg * Scientific photographs.

Otto Wolff * Berlin W., Karlsbad 15 * Electric precision resistances. 1811

1812 **Carl Zeiss, Optische Werkstätte** * Jena * Established 1846. Employs at present about 1300 workers. Branches in Berlin, Hamburg, Frankfort-on-the-Main, Vienna, London, St. Petersburg. Microscopes, micro-photographic outfit; projection-apparatuses (epidiascope); photographic objectives (planary, protary, unary, tessary); Palmos handapparatuses; Verant; Zeiss-field-glass; rifle telescopes for aiming; monocular and binocular mounted telescopes; landscape telescopes; astronomical telescopes; Stereotelemeters; Stereocomparators; Stereoscopes; optical measuring instruments. See grps. 3, 19 and 140 p. 364, 369, 371, 373, 374, 376, 378, 380, 425, 498 and 500.

In the German Hygiene Exhibition.

See Social Economy p. 494 and 500.

1813 **Prof. Dr. G. von Hüfner** * Tübingen.

1814 **Fritz Köhler, Universitätsmechaniker** * Leipzig.

1815 **A. Krüss, Optisches Institut** * Hamburg.

1816 **E. Leitz** * Berlin.

1817 **Otto Pressler, Fabrik wissenschaftlicher Apparate** * Leipzig.

1818 **F. Sartorius, Fabrik wissenschaftlicher Präzisionsinstrumente** * Göttingen und Rauschenwasser.

1819 **W. Schanze, Feinmechaniker** * Leipzig.

1820 **Franz Schmidt & Haensch, Optisch-mechanische Werkstätten** * Berlin.

1821 **W. & H. Seibert, Optisches Institut** * Wetzlar und Berlin.

1822 **Carl Zeiss, Optische Werkstätte** * Jena



1823 **Aktiengesellschaft Schaeffer & Walcker** * Berlin SW. 68, Lindenstrasse 18/19 * Kinematographic apparatuses and outfit therefore. Exhibit in "German-Tyrolese Alps." See p. 506.

1824 **Schumann & Cie., Rechenmaschinenfabrik "Saxonia"** * Glashütte i. S. * Arithmometer, system Thomas. Improved calculators for all systems of reckoning, indispensable for every undertaking, is known as the simplest, most reliable and durable machine. (In Liberal Arts Building.)

Group 20.

Medicine and Surgery.

German Education Exhibition

Department: Medicine and Surgery.

See Educational Matters p. 374.

German Hygiene Exhibition.

See Social Economy p. 494 and 500.

1825 J. D. Riedel, Fabriken chemisch-pharmazeutischer Präparate * Berlin * Case for freeing from poison, system Prof. Dr. Kobert.

1826 Zentralkomitee für das Rettungswesen in Preussen * Berlin * Graphic representation of conditions of life-saving and ambulance matters in the German Empire.

Exhibition of the United Royal Prussian and Grand Ducal State Railway Management

* Berlin *

Near Forsyth Avenue in the open air. Transportation, see p. 473.

1827 Medizinisches Warenhaus, Aktienges. * Berlin N., Friedrichstr. 108.

1828 E. Wulff & Hohmann, Berliner Krankenmöbelfabrik * Berlin C., Gertraudtenstrasse 8/9.

Group 21.

Musical Instruments.

1829 J. Blüthner * Leipzig * 1 Drawing-room grand piano, 2 Alignot system in dark mahogany case. German State Building, Hall, upper story. See p. 360.

1830 Deutsche Automatengesellschaft Stollwerck & Co. * Cöln a. Rh. * Automatons of every kind. (German-Tyrolese Alps.) See p. 506.

1832 August Diehl, Geigen- und Bogenmacher * Hamburg, Fuhlentwiete 23 * Founded 1876. Silver medal at the Hamburg Exposition 1889. Exhibits: three violins, constructed on artistic principles, built originally throughout, with oil varnish; exact copy of well known Stradivarius, one ditto Magini, and one original model with decorative relief carving. Violin and cello bows of own design, patented in several countries and recommended by virtuosi of the first rank. Flat build bows.

1833 Matth. Hohner, Harmonikafabrik * Trossingen * High class accordions and mouth harmonicas. Ocarinas of unbreakable pottery ware. Founded 1857. 1,500 workmen.

1834 Rud. Ibach Sohn, Hofpianofortefabrik * Factory for cottage pianos at Schwelm, for grand pianos at Barmen, and since 1904 also in Berlin. Branches at Berlin, Cologne, Düsseldorf, Bremen, Hamburg and London * Firm founded in 1794 by the great-grandfather of the present proprietor. Specialities: decorated cases in every style, heat proof instruments for the tropics and instruments for ships. Pianos for music schools and seminaries. Pianos for the stage and concert platform. Exhibit: symmetrical grand piano (German Patent) after plans by Prof. Billing of Carlsruhe, exhibited in the concert hall of the Baden Section. (Palace of varied Industries.) See grp. 37 p. 446.

1835 Gebrüder Jehmlich, Hoforgelbauer * Dresden * Organ machinery, pneumatic system. Blast worked by electro motor. (Palace of varied Industries.) See grp. 37.

1836 Carl Mand, Hoflieferant * Coblenz * A blue polished tarsia grand piano designed by Prof. Olbrich. (Palace of varied Industries.) See grp. 37 p. 453.

1837 J. Mollenhauer & Söhne, Hofinstrumentenmacher * Fulda * Founded 1822. Awards at all exhibitions where exhibited: Cassel 1823 and 1870, Paris 1867, Wittenberg 1869, Vienna 1873, Berlin 1898. Manufacturers of all wooden wind instruments. Speciality: Flutes, system Böhm, and piccolos.

1839 F. Ad. Richter & Cie. * Rudolstadt * Turning musical instruments: Libellions. (Palace of varied Industries.) See grp. 36 and 38 p. 445 and 459.

1840 E. Rittershausen * Berlin 59 * Special works for construction of flutes. Speciality: Flutes system Böhm. Founded 1876. Sole agent Carl Fischer, New York.

1841 Schledmayer, Pianofortefabrik vorm. J. & P. Schledmayer, K. und K. Hoflieferant * Stuttgart * Manufacturers of grand and upright pianos, also of Harmoniums. 14 Court purveyors diplomas, 40 medals and diplomas. Paris 1900 Grand Prix. Grand piano in oak designed by Prof. Pankok.

1842 Voigtländische Musikinstrumenten-Fabrik Hermann Dölling jun. * Markneukirchen i. S. * String instruments. (Palace of varied Industries.)

1843 M. Welte & Söhne * Freiburg, Baden * Pneumatic Organs, Orchestras and Orchestrions. Purveyors to princes and the gentry. Highest awards at all exhibitions. Founded 1832. Exhibits: 3 orchestrions in Lib. Arts Building, case designed by Prof. Hoffacker. 2 American organs in Baden and Leipsic Music room; cases designed by Prof. Billing and Drechsler, Architect. (Palace of varied Industries.) See grp. 37 p. 446 and 450.

Group 22.

Theatrical appliances and equipment.

1844 Aktien-Gesellschaft Schaeffer & Walcker * Berlin SW. 68, Lindenstr. 18/19 * Search light apparatuses for theatrical effects. Fittings. (German-Tyrolese Alps.) See p. 506.

1845 Max Eberhardt, Ingenieur * München, Goethestr. 74 * Fire extinguisher "Eberhardt" (in German State Building and in the German departments of the Exhibition palaces.) See p. 359 and grp. 64 p. 470.

1846 Laboratorium für chemische Feuerschutz- und Löschmittel Conrad Gautsch, G. m. b. H. * München. Branch office Berlin. Berlin W., Luitpoldstr. 38 * Experts for chemical fire extinguishers. Fire extinguishing substance: Gautsch' Standard fire extinguishing powder. Fire proof impregnation of stuffs and fabrics. Fire extinguishing apparatuses (in German State Building and German Departments of the Exposition palaces). See p. 359 and grp. 64 p. 471.

1847 L. Leichner, Kgl. Kommerzienrat * Berlin SW., Schützenstr. * Purveyor to the Royal Theatres, face powder, rouge. See grp. 23 p. 426.

1848 Minimax-Apparate-Bau-Ges. m. b. H * Berlin, Charlottenstr. 66 * Fire extinguishing apparatuses in German State Building. See p. 359.

Group 23.

Chemical and Pharmaceutical Arts.

German Education Exhibition.

Department: Chemical Exhibition in Palace of Industry.

See Education p. 363 and 364 to 373.

1849 Prof. Dr. Abegg * Breslau, Chem. Laboratorium der Universität * Electrochemical apparatuses, tables. See grp. 71 p. 367.

1850 Prof. Dr. Ahrens * Breslau, Matthiasplatz 8 * Literary works, periodicals.

1851 Aktien-Gesellschaft der Chemischen Produkten-Fabrik Pommerensdorf in Stettin. Established by the Royal decree of 8. April 1857 * Factories in Pommerensdorf near Stettin and in Wolgast * Present number of workmen 850. Products of wholesale Chemical Trade; yearly output about 80,000 tons.

1852 Aktien-Gesellschaft für Anilin-Fabrikation * Berlin SO. 36 * Factories in Germany: Berlin, Rummelsburg near Berlin, Greppin; in France: Saint Fons (Rhône); in Russia: Moscow, Libau. Agents and warehouses in all centres of industry. Branch establishments in America: Berlin Aniline Works, New York, Boston, Philadelphia, Chicago, Charlotte. Articles manufactured: Artificial organic dyestuffs, aniline dyes also the raw and intermediate products for manufacture of the same. Perfumes. Various pharmaceutical preparations. Photographic developers, Dryplates, Flat and rolled Films. The firm employs in its factories and branch establishments: 69 chemists, 15 engineers, 38 colorists, photographic officials, &c., 259 clerks, 1,978 male and 235 female operatives.

1853 Aktien-Gesellschaft für chemische Producte, vorm. H. Scheidemandel * Landshut (Bayern) * The head factory was founded in 1873 and was converted on 1. October 1895, on which occasion two rival works were bought up, into a joint-stock-company. At the present time the company owns 9 factories, two of which are in Landshut and one in each of the following towns Hassfurt, Königsberg in Bohemia, Lehrberg, Allendorf, Lüneburg, Heiligensee and Ohlau. The articles manufactured include gelatine, finest and cheaper size, mixed- and bone-glues as well as glue powder, bone oil and bone meal.—Large export business to three seaports by means of convenient waterways.—Largest Concern in this branch in Germany.

1854 **Akt.-Gesellschaft für Teer- und Erdöl-Industrie** * Berlin W., Flottwellstr. 7 * Products of coal-tar-distillation, &c.

1855 **Paul Altmann** * Berlin NW., Luisenstrasse 47 * Combustion-furnace with fittings.

1856 **W. Apel** * Göttingen * Electrochemical apparatuses after Nernst.

1857 **Amme, Giesecke & Konegen** * Braunschweig * Laboratory-mill.

1858 **Prof. Dr. Anschütz** * Bonn-Poppelsdorf, Meckenheimer Str. 158 * Preparations, plans, distillation in vacuum, combustion-furnace with fittings.

1859 **Badische Anilin- und Sodafabrik** * Ludwigshafen a. Rhein * Joint-stock-company with a capital of 21 million marks. Year of foundation of the Ludwigshafen factory: 1865. Number of workmen: 7,750, number of officials: 880. Branches in Neuville-sur-Saône and in Butirki near Moscow. Manufactures: Artificial dye-stuffs, namely aniline-, resorcine-, naphthaline-, azo- (and substantive cotton-) and sulphur-dyes; aniline-oil, aniline salt, alizarin dyes, gallic acid dyes; raw and auxiliary materials for the manufacture of the above. Indigo pure BASF (synthetic indigo), indigo preparations. Chrome and other mordants for dyeing and printing. Strong sulphuric acids, oleum and sulphuric anhydride; chlorosulphonic acid, sulphurous acid and sulphites, durable hydrosulphites; liquid chlorine and chlorine derivatives; acetic anhydride; phthalic acid, benzoic acid, benzoic aldehyde.

1860 **Georg Bartels, Mechaniker** * Göttingen * Apparatuses after Jolezalek.

1861 **Johann Ambrosius Barth, Verlagsbuchhandlung** * Leipzig * Literary works.

1862 **Prof. Dr. Beckmann, Geh. Hofrat** * Leipzig, Bruderstr. 34 * Apparatuses for determining molecular weights, preparations of the menthol and camphor series. Spectroscope for educational purposes.

1863 **Prof. Dr. Behrend** * Hannover, Herrenhäuser Kirchweg 20 * Original preparations of the synthesis of uric acid.

1864 **Prof. Dr. Biehringer** * Braunschweig, Techn. Hochschule * Preparations.

1865 **Prof. Dr. Biltz** * Kiel, Holtenauer Str. 148 * Preparation resp. auto-oxydation. Apparatuses for determining vapour density.

1866 **Dr. Biltz, Privatdozent** * Göttingen * Apparatuses for determining vapour density.

1867 **Prof. Dr. Blochmann** * Königsberg, Chem. Labor. d. Univers. * Inorganic preparations. Literary works.

1868 **C. F. Boehringer & Söhne** * Mannheim-Waldhof * Factory for chemical products. Branch-warehouse in New York. Founded in 1859. 450 workmen, 33 chemists and engineers. Manufactures alkaloids, glucosides, extracts, synthetic medicaments, synthetic perfumes, glycerine, ether, gallic acid, resorcine, hydroquinone, &c. Numerous patents, especially in the branches of the synthesis of caffeine and the electrolytic reduction of nitrobenzene.

1869 **Prof. Dr. Borchers, Geh. Reg.-Rat** * Aachen, Techn. Hochschule * Electrical furnaces. See grp. 68 p. 364 and 367.

1870 **Prof. Dr. Bredig** * Heidelberg, Römerstr. 35 * Electrochemical apparatuses. Literary works. See grp. 68 p. 364 and 367.

1871 **Prof. Dr. Bredt** * Aachen, Techn. Hochschule * Model of the constitution of camphor. Preparations.

1872 **Prof. Dr. Brunck** * Freiberg i. S., Kgl. Sächs. Bergakademie * Apparatuses for gas-analysis. Inorganic preparations.

1873 **Prof. Dr. von Buchka, Geh. Reg.-Rat** * Berlin W., Keithstr. 21 * Literary works.

1874 **Prof. Dr. Buchner** * Berlin NW., Wilsnacker Str. 3 * Hydraulic press. Preparations illustrating the chemistry of fermentation.

1875 **Prof. Dr. Bülow** * Tübingen, Osterberg 21 * Preparations of the benzopyranol group.

1876 **Prof. Dr. Bunte, Geh. Hofrat** * Karlsruhe i. B., Nowackanlage 13 * Gasburette.

1877 **Prof. Dr. Busch** * Erlangen, Löwenichstrasse 19 * Organic preparations.

1878 **Leopold Cassella & Co.** * Frankfurt a. M. * The firm was founded in 1828, the factory at Mainkur in 1870. Branch factories: Manufacture Lyonnaise de matières colorantes, Lyon. Russische Anilinfarben-Fabrik Leopold Cassella & Co., Riga. American house: Cassella Color-Company, New York, 182 and 184, Front Street. Artificial dyestuffs; in particular: Acid-azo-dyestuffs for wool, diamine dyestuffs, "Immediate" dyestuffs, anthracene acid dyestuffs, anthracene chrome dyestuffs, diaminogen dyestuffs, basic dyestuffs, eosine dyestuffs, rosaniline dyestuffs.

1879 **Kölner Ceresinfabrik Gebrüder Maus, G. m. b. H.** * Cöln a. Rh. * Ozokerite, Ceresine, bleached Carnauba Wax. Speciality: Ozokerite Cable wax for insulating and impregnating all kinds of cables. Warehouses in Hamburg, London, Paris, Trieste, Genoa and Barcelona. Representatives and agents in all foreign and transmarine places. Estd. 1898. Awards: Düsseldorf 1902.

1880 **Alwin Nieske, Chemische Fabrik Altherzberg** * Dresden-N. 8 * Chromium-, Tungsten- and Molybdenum metals and salts. Tungsten Copper and Tin Mining works in Spain. Tin-, Baryta- and Zinc-white. Aluminium palmitate. Chromium salts. Molyform. Ammoniac. Ammonium carbonate. Estd. 1877. 130 workmen. Gold and State Medals of Merit.

1881 **Chemische Fabrik von Hugo Blank** * Berlin * Products of Wood distillation: Methylalcohol, Formic aldehyde, liquid and solid (Trioxymethylene), Acetic acid, Acetic anhydride, Acetone.

1882 **Chemische Fabrik Durlach, Dr. Neuberg** * Durlach, Baden * Tartaric acid and Sulphites. Speciality: Chemically pure Cream of Tartar for Baking powder. Surpasses all other products in the world as regards purity and quality. Manufactured by special process. Total output in 1903: over 2,000,000 kgs, of which 1,500,000 kgs were exported to all parts of the world.

1883 **Chemische Fabrik Gernsheim-Heubruch** * Mannheim * Salts of metals, Nitro-, Amido- and Chlorine derivatives, Aromatic Hydrocarbons.

1884 **Chemische Fabrik Griesheim-Elektron, Aktiengesellschaft** * Frankfurt a. M. * Estd. 1856. Works in Griesheim a M., Mainthal, Spandau, Küppersteg, Bitterfeld, Rheinfelden i. B. 160 Officials, 2,500 workmen. Products: Mineral acids, Alkalies, Sodium, Magnesium, Calcium carbide, Ferrosilicium, Chromates, Permanganates, Nitrite, Sulphur, Phosphorus, Hydrogen (compressed), Chlorine (liquid), Bleaching powder, Chlorides of Sulphur and Phosphorus, Bisulphide and Tetrachloride of Carbon, organic Nitro- and Chloro-nitro-compounds, Aniline derivatives.

1885 **Chemische Fabrik Hönningen, vormals Walther Feld & Co., Aktiengesellschaft** * Hönningen a. Rh. * Manufacturers of Barium- and Strontium-preparations. Specialities: Barium Carbonate 96 to 99 percent, Barium Hydrate 96 to 98 percent, Barium Oxide, Crude Sulphide of Barium 70 to 80 percent, Permanent white, Strontium Carbonate 92 to 95 percent, Strontium Hydrate, Barium Chloride, Sulphuric acid, free from arsenic and iron, especially for accumulators, Sodium Sulphate, Hydrochloric acid, free from arsenic, Nitric acid, compressed Carbonic acid. See p. 367.

See advertisements p. 15.

1886 **Chemische Fabrik, Dr. Eugen Schaal** * Feuerbach * Varnish preparations.

1887 **Chemische Fabriken vorm. Weiler-ter Meer** * Ürdingen a. Rh. * Estd. 1861. Factories in Ürdingen a. Rh., Cöln a. Rh., Müngersdorf, Crefeld and Riehl. 900 officials and workmen. Engines of 1,300 H. P. 26 Boilers with 2,650 qm heating surface. Specialities: Aniline dyes and intermediate products. Sulphur dyes: Auronal-Black, -Brown, -Green, -Olive, -Orange, -Yellow. Substantive Dyes: Black, Brown, Green, Blue, Orange, Chrysophenine, Congo Red, Benzopurpurine. Basic Dyes: Bismarck Brown, Chrysoidine, Malachite Green, Brilliant Green, Methylene Blue, Methyl Violet, Crystal Violet, Fuchsine, Auramine. Acid Dyes: Wool Black, Acid Brown, Night Green, Induline, Wool Blue, Water Blue, Acid Violet, Fast Red, Azorubine, Ponceau, Scarlet, Orange, Azoflavine, Azo Yellow, Methanil Yellow, Naphthol Yellow, Nigrosine and Induline, soluble in water and spirit. Dyes soluble in Spirit and in Fats. Paranitraniline, Aniline oil, Aniline salt, Alphanaphthylamine, Dimethylaniline, Monoethylaniline, Diethylaniline, Diphenylamine, Benzidine, Tolidine, Naphthylamine sulphonic acids. Stannous Chloride. Pink salt, &c. Numerous Patents. Export to all countries.

1888 **I. Chem. Institut der Universität Berlin** * Busts and preparations of Liebig's, Wöhler's and A. W. von Hofmann's.

1889 **Chem. Institut der Universität Bonn** * Preparations and Models of Aug. Kékulé's.

1890 **Geh. Regierungsrat Prof. Dr. Classen** * Aachen, Techn. Hochschule * Apparatuses and Models for quantitative analysis. Eletrolysis.

1891 **Prof. Dr. Cohen** * Göttingen * Electrolytic Carbon precipitates.

1892 **Prof. Dr. Conrad** * Aschaffenburg, Forstakademie * Preparations from the department of Malonic acid Syntheses.

1893 **Prof. Dr. Dennstedt** * Hamburg, Jungiusstrasse * Combustion Apparatus, Pyrrol preparations.

1894 **Deutsche chemische Gesellschaft** * Berlin, Sigismundstr. 4 * Plans of the Hofmann House, literary Works.

1895 **Carl Diederichs, Inh. Spindler & Hoyer** * Göttingen * Apparatuses after Nernst.

1896 **Dr. Dimroth** * Tübingen, Hölderlinstrasse 22 * Mercury compounds of Phenols.

1897 **Prof. Dr. Doebner** * Halle a. S., Albrechtstrasse 3 * Organic preparations.

1898 **Prof. Dr. Drude** * Giessen, Phys. Inst. d. Universität * Electrochemical apparatuses. See grp. 71 p. 368.

1899 **R. Eisenmann** * Berlin, Mühlenstr. 6–7 * Absolute Alcohol, Sulphuric Ether, Collodium of all kinds, Stiffening liquid for Incandescent mantles, Amylacetate, Amyl-, Butyl- and Propylalcohol.

1900 **Prof. Dr. Elbs** * Giessen, Hofmannstr. 5 * Electrochemical apparatuses, Preparations obtained by means of electrolylis. See grp. 68 p. 364 and 368.

1901 **Prof. Dr. Emmerling** * Berlin W., Meineckestr. 9 * Organic and physiological preparations.

1902 **Prof. Dr. Engler, Geh. Hofrat** * Karlsruhe i. B., Kaiserstr. 12 * Models of atoms, First Synthesis of Indigo, artificial Petroleum, Apparatuses.

1903 **Prof. Dr. Erdmann** * Charlottenburg, Leibnizstr. 80 * Apparatuses.

1904 **Farbenfabriken vorm. Friedr. Bayer & Co. Akt.-Ges.** * Elberfeld, Leverkusen a. Rh., Barmen, Schelploh (Germany), Moscow (Russia), Flers (France) * Established 1850. Employs 1,260 Officials including 165 Scientific Chemists, 34 Engineers with University Diplomas, 72 Mechanics and 5500 Workmen. Manufacture: Sulphuric acid and Anhydride, Nitric acid Hydrochloric acid, Alkalies, all intermediate products of the Coal-Tar Branch, all Alizarine-dyes (alizarine-Cyanines, -Saphirol), Aniline- and Azo-dyes (Diamond Black, Sulfonecyanine, Direct deep-black), Katigen Dyes (Katigen-black, Katigenindigo). Pharmaceutrical Products: Agurine, Aristol, Aspirine, Citarine, Helmitol, Heroine, Isopral, Mesotane, Protargol, Salophene, Tannigene, Thezoine, Triona, Somatose, Creosotal, Duotal, Piperazine, Phenazetin, Sulphonal, Salicylic-acid, Salol, Aristochine, Veronal. Photographic Products: Edinol, Bayer's-Flashlight, Bayer's Adherive Paste, photographic papers.



1905 **Farbwerke vorm. Meister Lucius & Brüning A.-G.** * Höchst a. M. * Established 1862 * Capital 17 Million Marks. Branch establishments: Gersthofen (Bavaria), Moscow (Russia), Creil (France). The staff consists of 810 officials (225 chemists, 335 clerks, 55 engineers, 200 foremen) and about 5,500 workmen. 1. Coal Tar Dyes (Aniline-, Resorcine-, Naphthaline-, Azo-, Alizarine--dyes, Dyestuffs for developing in the fibre, Indigo; in all 3,000 Dyestuff standard), Intermediate products and Mordants. 2. Technical-Chemical products (Acids, Caustic soda, &c.). 3. Pharmaceutical Products: e. g. Antipyrine, Pyramidone, Migranine, Anæsthesine, Albargine, Diphtheria-Remedy, Tetanus-Antitoxine, Curative serums for combating infectious diseases of animals (Anthrax serum, &c.), Koch's Tuberculine. 4. Chemicals for photographic purposes (Developers, Fixing salt, Dyestuffs for Three colour photography and Lightfilters). About 1,200 Patents in Germany and abroad, about 700 Trademarks. Numerous Highest awards.



Trademark

1906 **Prof. Dr. E. Fischer, Geh. Reg.-Rat** * Berlin, Hessischestr. 3 * Organic Dyestuffs, Phenylhydrazine, Uric acid group, Sugar group, Decomposition of albumen, Syntheses of Polypeptides, Apparatuses. Literary works.

1907 **Prof. Dr. F. Fischer** * Göttingen, Hohe Strasse 1 * Apparatuses for Gasanalysis. Calorimeters.

1908 **Prof. Dr. O. Fischer** * Erlangen * Chem. Instit. d. Univers. Organic Dyestuffs.

1909 **Prof. Dr. Freund** * Frankfurt a. M., Stiftsstrasse 32 * Alkaloids.

1910 **Prof. Dr. Fromm** * Freiburg i. B., Bismarckstr. 6 * Organic preparation.

1911 **Prof. Dr. Gabriel** * Berlin, Reichstagsufer * Organic preparations.

1912 **August Gerber** * Cöln a. Rh. * Busts.

1913 **Germanisches Museum** * Nürnberg * Alchemistic apparatuses.

1914 **J. Giesel & Co.** * Dresden-Plauen * Manufacturers of non-poisonous colours for food and relishes, soap and fat industry; Fruit aroma essences for sweet-meat manufacture. Ethereal oils and essences. Export to all civilised countries. Awards: Gold and Silver Medals. See p. 371. See advertisements p. 13.

1915 **Dr. Heinrich Göckel** * Berlin W. 9 * Physikalisch-chemisches Institut, Speciality: Manufacture and testing of Standard glass-instruments, Reagents and Solutions.

1916 **Th. Goldschmidt, Chemische Fabrik und Zinnhütte** * Essen-Ruhr * Established 1847. 400 Workmen. Value of yearly output 8,000,000 M. Diploma: Berlin 1879. Medals: Chicago 1893, Gold medals: Paris 1900, Düsseldorf 1902; Prussian State Medals. U.S.A. The Goldschmidt Thermit Company, New York, Wall Street, Exchange Building 43-7, room 1508 Exchange Place. Metals free from carbon, Chromium, Manganese, Ferrotitanium, Molybdenum, Ferrovanadium, &c., Thermite for carrying out the Goldschmidt aluminothermic method of welding and hard-soldering. Tramway lines Tubes, Steel and Iron Castings welded with Thermite, Korubin and polishing discs. Titan Thermit and anti-piping thermit for obtaining iron and steel castings free from blowholes and of a finer grain.



1917 **Dr. H. Grossmann** * Münster i. W., Universität * Inorganic Double salts.

1918 **Haarmann & Reimer, Chemische Fabrik zu Holzminden, G.m.b.H.** * Holzminden (Braunschweig) * Established 1874. Manufacture of synthetic Perfumes. The following bodies were either discovered or first manufactured by our firm: Vanilline (1874), Heliotropine and Cumarine (1878), Terpineol (1889), Isoeugenol (1890), Linalool and Linalylacetate (1891), Jonone (1893), Irone (1893), Pineapple aroma (1901), Oil of Cassia flowers, artificial (1903). Our products obtained Silver and Gold Medals at the following Exhibitions: Philadelphia 1876, Frankfurt a. M. 1877, Amsterdam 1877, Sidney 1879, Hamburg 1880, Melbourne 1880/81, Frankfurt a. M. 1881, Antwerp 1885, Berlin 1888; Chicago 1893. In Paris 1900 the firm obtained the Grand Prix of Group III. Export to all parts of the world. In the United States of America the products of the firm are manufactured by the Haarmann-de Laire-Schaefer Co. in Maywood, New Jersey. The manufacture of most of the products is secured to the firm by patents in all civilised countries.

1919 **Prof. Dr. Harries** * Charlottenburg, Berliner Str. 36 * Distillation in vacus. Ozone apparatus. Literary works. Organic preparations.

1920 **Hartmann & Braun, Mechaniker** * Frankfurt a. M.

1921 **Heidelberger Gelatinefabriken Stoess & Co.** * Heidelberg * Gelatine for various purposes.

1922 **Prof. Dr. Hempel, Geh. Hofrat** * Dresden, Technische Hochschule * Apparatuses for fractional distillation and for Gas and Smoke-gas Analysis.

1923 **W. C. Heraeus** * Hanau * Vessels of Quartzglas, electric furnaces. Platinum apparatuses for Chemical laboraties. See Grp. 19 p. 413.

1924 **Gebr. Heyl & Co., G. m. b. H.** * Charlottenburg * Manufacturers of Chemical colours. Established 1833. Colours for the Glazed paper-, Wall paper- and Paper industries, for Printing and Lithography. All mineral-, wood varnish- and aniline varnish-colours. Paris- and Steel blue, Manganous borate, Permanent White for Chromo- and photographic papers.

1925 **Prof. Dr. Holde** * Berlin, Geisbergstr. 40 * Analytical apparatuses for the analysis of Fats and Petroleum. Organic preparations.

1926 **E. Hugershoff** * Leipzig * Ampèremeter after Bredig & Hahn.

1927 **Ichthyolgesellschaft Cordes Hermanni & Co.** * Hamburg * Ichthyol preparations. See p. 372. See advertisements p. 24.

1928 **Prof. Dr. Jacobson** * Berlin, Genthiner Str. 14 * Models, preparations and literary works.

1929 **Kalle & Co.** * Biebrich a. Rh. * Established 1863. Branch Houses: U.S.A.: Kalle & Co., New York, Boston, Philadelphia, gegründet 1882. Russia: Chemical Works Kalle & Co., Warsaw, established 1884; Chemical Works Kalle & Co., Warsaw, Warehouse in Lodz, established 1903. Austria: Miller, Kalle & Co., Hruschau 1903. Agencies in all centres of industry. Artificial dyestuffs: Aniline-, Azo-, Naphtaline- and Sulphur dyestuffs for wool, silk, cotton, leather, paper, &c. &c.; Raw- and intermediate products for Coal Tar Dyestuff manufacture; Pharmaceutical preparations. 106 Clerks, 88 technical Officials (Chemists and Engineers) and 600 Workmen. Export to all European and American States, also to Japan, China, India, Australia and Africa. Owners of numerous Patent brands and Trademarks in all civilised countries. The firm obtained Awards at the International Exhibitions in Paris 1867, Vienna 1873, Barcelona 1888, Chicago 1893, Paris 1900, also at the Exhibitions in Nishnij Novgorod 1896, Düsseldorf 1901, Osaka 1903; the firm also obtained the Royal Prussian State Medal in 1901.

1930 **Erwin Kerker, Mechaniker** * Breslau * Apparatuses after Abegg.

1931 **Knapp, Verlagsbuchhandlung** * Halle a.S. * Collection of electrochemical works.

1932 **Dr. O. Knöfler & Co.** * Plötzensee b. Berlin * Manufactory of chemical preparations for Incandescent Gaslighting: Thorium and Cerium nitrate, &c. Established 1889.

1933 **Knoll & Co.** * Ludwigshafen a. Rh. * Establ. 1886. Chemico-pharmaceutical preparations, especially alkaloids and new medicaments.

1934 **Prof. Dr. Knorr, Geh. Hofrat** * Jena, Chem. Instit. d. Universit. * Organic Preparations. Pyrazoles, Morpholine, Decomposition of Morphine. Tautomerism.

1935 **Fritz Köhler, Mechaniker** * Leipzig * Apparatuses after Oswald.

1936 **Prof. Dr. König, Geh. Reg.-Rat** * Münster i. W., Agrik.-chem. Versuchsanstalt * Apparatuses, Cellulose preparations, literary works.

1937 **Prof. Dr. Kühling** * Charlottenburg, Bismarckstr. 21 * Literary works.

1938 **Prof. Dr. W. Küster** * Tübingen, Kepplerstr. 20 * Haematine preparations.

1939 **Dr. Kunckell** * Rostock i. M., Chemisches Institut der Universität * Organic preparations.

1940 **Kunheim & Co.** * Berlin, Dorotheenstrasse 32 * Preparations of Rare earths, Inorganic salts, Liquefied gases. Products obtained by working of Gas purifying mixture, Alloys.

1941 **Dr. Kutscher** * Marburg, Phys.-Chem. Institut * Yeast preparations.

1942 **Prof. Dr. Ladenburg, Geh. Reg.-Rat** * Breslau, Kaiser-Wilhelm-Str. 108 * Inorganic and organic preparations, literary works.

1943 **Prof. Dr. Lange** * Krefeld, Dyeing and Finishing School * Demonstration resp. Application of Dyestuffs.

1944 **E. A. Lentz** * Berlin N., Gr. Hamburger Str. 2 * Stirring and shaking apparatus for laboratories, driving shaft for work table, draught cupboard, vacuum pump, vacuum apparatus.

1945 **Oskar Leuners Mechanisches Institut** * Dresden * Apparatus for technical Gas-analysis, Measuring burettes with and without corrections for temperature and air-pressure. Absorption and combustion pipettes. Apparatuses for exact gas-analysis of Mercury, with all absorptions and measuring apparatuses after Geheimrat Professor Dr. Walther Hempel in Dresden (see "Gasanalytische Methoden" by Dr. Walther Hempel, 3d Edition 1900. Translated from the third German edition and considerably enlarged by L. M. Dennis, Professor of Analytical and inorganic chemistry in Cornell University. 1902). The firm was established in 1870; the present owner constructed and supplies instruments for testing iron bridges such as apparatuses for the graphic measurement of tension, flexion, horizontal vibrations and deformation. Indicator diagram apparatuses, self registering measurers for tension and the strength of materials, Graphic apparatus for showing the velocity of water Apparatus for drawing the cross- and longitudinal sections of water courses, &c. (own Patents). See advertisements p. 30.

1946 **Prof. Dr. Liebermann, Geh. Reg.-Rat** * Berlin, Matthäikirchstr. 29 * Organic Preparations, Synthesis of Alizarine.

1947 **Prof. Dr. Lindner** * Charlottenburg, Stuttgarter Platz 1 * Apparatuses, Models, Preparations resp. Chemistry of Fermentation.

1948 **Prof. Dr. von Lippmann** * Halle a. S., Raffineriestr. 28 * Literary works.

1949 **G. Luther, Akt.-Ges.** * Braunschweig * Laboratory mill.

1950 **Friedrich Lux** * Ludwigshafen a. Rh. * Gas balance. See grps. 19, 23 and 64 p. 365, 373, 413 and 471.

1951 **Dr. Mahla** * Berlin, Keithstr. 8 * Organic preparations.

1952 **Prof. Dr. Marckwald** * Berlin, Kurfürstendamm 240 * Organic preparations, Radioactive substances.

1953 **Dr. L. C. Marquart** * Beuel-Bonn a. Rh. * Factory for manufacture of chemical, pharmaceutical, technical and scientific preparations. Establ. 1846. Awards: London 1851, Düsseldorf 1852, Munich 1854, Treves 1854, Paris 1855, London 1862, Paris 1867, Amsterdam 1869, Vienna 1873, Philadelphia 1876, Düsseldorf 1880, Antwerp 1885, Antwerp 1894, Paris 1900, Düsseldorf 1902. Specialities: Acetocaustine, Camphoric acid, Cinnamic acid, Ferrocyanic acid, Fumaric acid, Malonic acid, Malic acid, Phosphomolybdenic acid, Sorbic acid, Titanic acid, Ammonium nitrate, Phosphomolybdate of ammonia, Bismuth subnitrate, Cadmium acetate, Caesium alum, Caesium bitartrate, Calcium bimalate, Calcium malate, Powdered oxide of copper, granular copper acide, Eudermol, Ferrostyptine, Hexamethylene tetramine, Jodoformine, Jodoformal, Potassium permanganate, Copper-potash alum, Lithio-Piperazine, Lithium bromide, Li-

thium carbonate, Lithium chloride, Lithium citrate, Caustic Soda. Soda-lime, Nicotine puriss., Nicotine sulphate, Ol. sorbi, Pepsine, Picrocarmine, Lead iodide, Rubidium Alum, metallic Zinc, Zirconium hydroxide, Molybdæn preparations. Preparations for Bacteriology, Chemical analysis, Electrotyping, Iron Works, Ceramic art, Laboratories, Microscopic work, Perfumery, Pharmacy, Photography, Pyrotechnic and Textile industry.

1954 **Franz Mayerhoff & Co., Maschinenfabrik** * Berlin N. 28 * Geschäftsgründung 1875. Ice-machines of any capacity for Chemical Works and Laboratories. Gold and Silver Medals.

1955 **E. Merck, Chemische Fabrik und bakteriologisches Laboratorium** * Darmstadt; Branch establishments in Moscow and London; Merck & Co., New York and St. Louis * All Chemicals for Medicinal-pharmaceutical purposes, especially alkaloids and glycosides, also the following specialities: Bromipine, Dionine, Jodipine, Stytizine, Tannoform, Tropacocaine, Veronal, 30 percentages chemically pure Hydrogen Peroxide, also strong Diphtheria Serum remedy, Streptococcus serum, Pneumococcus serum, Anthrasc serum, Thyroid serum, Jequiritol and Jequiritol serum, also all Reagents for medical, pharmaceutical and technical purposes; likewise Chemicals and Preparations for microscopic, bacteriological and photographic use, and preparations for Incandescent Gas-light, Preparations for the Textile Industry, Pyrotechnics, Perfumery, Fermentation and allied Industries. See p. 367, 369, 371, 372 and 379 and grp. 140 p. 499.

1956 **Prof. Dr. von Meyer, Geh. Hofrat** * Dresden, Lessingstr. 6 * Literary works. See p. 365.

1957 **Prof. Dr. Meyer** * Braunschweig, Moltkestrasse 11 * Organic preparations. See p. 366 and 370.

1958 **Prof. Dr. Meyerhoffer** * Berlin, Uhlandstrasse 162 * Models. See grp. 68 p. 366.

1959 **Prof. Dr. Michaelis** * Rostock i. M., Chem. Inst. d. Universität * Inorganic and organic preparations. See p. 366 and 369.

1960 **Prof. Dr. Miethe** * Charlottenburg, Techn. Hochschule * Preparations for Photography in Natural colours. See p. 364, 370 and 373 and grps. 16 and 19 p. 406 and 414.

1961 **Robert Mittelbach, Mechaniker** * Göttingen * Apparatuses after Nernst. See p. 368.

1962 **Prof. Dr. Mitscherlich** * Freiburg i. B., Chem. Inst. d. Univ. * Preparat. See p. 372.

1963 **Prof. Dr. Möhlau** * Dresden, Semperstrasse 4 * Colloidal Indigo. See p. 370.

1964 **Prof. Dr. A. Naumann, Geh. Hofrat** * Giessen * Apparatuses of Liebig's. See p. 365.

1965 **Prof. Dr. Nernst** * Göttingen, Bürgerstrasse 50 * Electrochemical apparatuses, Electrochemical laboratory table. See p. 365, 366 and 368.

1966 **Prof. Dr. Noelting** * Mühlhausen i. Els., Städt. Chemieschule * Organic Dyestuffs. See p. 370.

1967 **K. Oehler** * Offenbach a. M. * Anilin- and Anilinfarbenfabrik. Established 1850. 600 officials and workmen. Manufactures: a) Intermediate products: Aniline and Aniline salt, Toluidine, Nitrobenzene and Nitrotoluene, Tolidine, Benzidine, Paranitraniline, β-Naphthylamine, Diphenylamine, Methylaniline, Naphthol- and Naphthylaminesulphonic acids, &c. b) Dyestuffs: Fuchsine, Phosphine, Leather Yellow, all kinds of aniline blue, solid blue (Induline), Methylviolet, Benzoflavine, azo-dyes, especially Methanil yellow, cloth red, Toluylene-orange and -brown, Naphthazurine blue, Triazol-dyes, Congo and Benzopurpurine, Hydrazine yellow, &c. See p. 370 and 371.

1968 **Prof. Dr. Ost** * Hannover, Techn. Hochschule * Models, Diagrams, Inorganic and Organic preparat. for technological instruction. See p. 366 to 369 and 372.

1969 **Prof. Dr. Ostwald, Geh. Reg.-Rat** * Leipzig, Phys.-chem. Inst. d. Univ. * Electrochem. apparatuses. See p. 365 and 368.

1970 **Prof. Dr. Paal** * Erlangen, Engelgasse 9 * Preparations of colloidal Metals, preparations of Chinazoline derivatives. See p. 366, 370 and 371.

1971 **F. W. Pest** * Berlin * Copper goods factory. Estabi. 1830. Spec.: Brewery apparatuses. Copper apparatus for cultivat. of pure yeast after Prof. Dr. Paul Lindner.

1972 **Prof. Dr. Pfeffer** * Leipzig, Linnéstr. 1 * Apparatuses for the measurement of Osmotic Pressure. See grp. 71 p. 366.

1973 **Prof. Dr. Pinner, Geh. Reg.-Rat** * Berlin, Luisenstr. 56 * Organic preparations, Decomposition of Nicotine.

1974 **Kgl. Preussische Porzellanmanufaktur** * Berlin * Porcelain Vessels, &c., for chemical laboratories. See grp. 46 p. 464.

1975 **Dr. Pschorr** * Berlin W., Kurfürstendamm 25 * Apparatuses, preparations of the Phenanthrene- and Morphine Series. See p. 371.

1976 **Dr. F. Raschig** * Ludwigshafen a. Rh. * Largest factory in the world for crystallized and liquid Carb. acid, Orthocresol, Metacresol and Paracresol. See p. 370.

1977 **Prof. Dr. Reinke** * Braunschweig, Techn. Hochschule * Apparatuses and preparations illustrating the Chemistry of Fermentation. See p. 372 and 373.

1978 **Prof. Dr. Reissert** * Literary works.

1979 **Prof. Dr. Rimbach** * Bonn, Beckenheimer Str. 71 * Literary works. See p. 365.

1980 **Dr. Rohde** * München, Theresienstrasse * Cinchotoxine, Cinchonine, Quinine preparations. See p. 371.

1981 **Dr. Rosenheim** * Berlin, Alsenstrasse * Inorganic preparations. See p. 366.

1982 **Jacques Rosenthal** * München * Dealer in old books. Alchem. literature. See p. 365.

1983 **Prof. Dr. Ruff** * Berlin, Thomasiusstrasse * Apparatuses, Inorganic and Organic preparations. See p. 366–368 and 372.

1984 **Gebrüder Ruhstrat** * Göttingen * Electrochemical laboratory table. See p. 368.

1985 **Dr. Sachs** * Berlin, Hessische Strasse * Organic preparations. See p. 369.

1986 **E. Sachsse & Co., Inhaber Dr. Otto Lampe und Albert Dufour Feronce** * Leipzig * Factories in Leipzig-Reudnitz and Liesing near Vienna, in which the following materials are treated: Aromatic woods, Seeds, Plants, Spices, Drugs, Chemicals and Spirit. From these are manufactured: Ethereal oils, artificial Perfumes, Pharmaceutical preparations, Fruit-ethers and essences for liqueurs, beverages and sweetmeats. Of the above we specially mention: Ambrette seed oil, Anethol, oils of Bergamotte and of Lemons free from terpenes, Cognac oil, Iris oil, oil of carraway, Nutmeg oil, artificial oil of Neroli, oil of Roses and Ylang ylang oil, Patchouli oil, Sandalwood oil, oil of Cinnamon, Benzyl acetate, Bornyl acetate, Carvol, Citral, Citronellol, Eucalyptol, Geraniol, Hyacinthine, Linalol, Linalyl acetate, Menthol, Neroline, Thymol, Cinnamyl alcohol. The first to manufacture on a large scale the following: Hirudine (patented in various States), a new product obtained from leeches to prevent the coagulation of the blood. Export trade to all parts of the world. Awards: London 1862, Stettin 1865, Paris 1867, Moscow 1872, Vienna 1873, Dresden 1895, Philadelphia 1876, Amsterdam 1877, Sydney 1879, Hamburg 1879, Melbourne 1881, Porto Alegre 1881, Amsterdam 1883, Leipzig 1897. The firm was established in 1895 by the grandfather of the two present proprietors Geh. Kammerrat Dr. Carl Lampe, along with the chemist Mr. Emil Sachsse in connection with his wholesale drug business existing since 1750, Brückner, Lampe & Co., Leipzig, Berlin, Hamburg, to the partners of which the present owners of the firm E. Sachsse & Co. still belong. See p. 372.

1987 **Prof. Dr. Salkowski, Geh. Reg.-Rat** * Münster i. W., Chem. Inst. d. Universität * Organic preparations. See p. 370 and 372.

1988 **Prof. Dr. Salkowski** * Berlin, Physiolog.-chem. Institut der Universität * Physiological preparations.

1989 **F. Sartorius** * Göttingen (Prov. Hannover) * Mechanical Factory for precision instruments. Analytical Balance in mahogany case with counterbalanced front slide; at 200 grs. maximum charge, sensitiveness 1–10 grs. A set of gold plated weigths from 1 mg to 100 g. Hydrostatic Balances with steel knife-edges for liquids. All kinds of finer balances for physical, chemical and technical purposes. Established 1870. 100 workmen. Prizes awarded at all Exhibitions where represented. At the International Exposition in Brussels they received a Special Prize for the best type of analytical Balance. Yearly output about 750 balances. Export to all countries. See grps. 19, 20 and 140 p. 367, 368, 415, 426 and 498.

1990 **Schmidt & Haensch, Franz** * Berlin S. 42, Prinzessinnenstr. 16 * Polarising apparatuses, Photometers, &c. See p. 366, 373, 376 and grp. 19 p. 414 and 415.

1991 **W. Schmidt, Mechaniker** * Giessen * Apparatus after Elbs and Drude. See p. 368.

1992 **Prof. Dr. Scholl** * Karlsruhe I. B., Bunsenstr. 15 * Fulminate of mercury preparations. See p. 369.

1993 **Schott und Genossen** * Jena * Glass vessels for chemical purposes. See grps. 19 and 140 p. 366, 374, 414, 426 and 498.

1994 **Dr. Theodor Schuchardt** * Görlitz (Schlesien) * Est. 1863. Awards at 27 Exhibitions. Chemicals for scientific, photographic, pharmaceutical and ceramic purposes. Speciality: Pure Reagents, Chemical preparations, chemicals for Incandescent Gas Light, Metallic oxides. See p. 367, 369 and 371.

1995 **Prof. Dr. Schultz** * München, Giselastr. 3 * Organic dyestuffs. See p. 370.

1996 **Prof. Dr. Siegfried** * Leipzig, Lindenstr. 1 * Albumen preparations. Apparatuses. See p. 371 and 372.

1997 **Prof. Dr. Staedel, Geh. Reg.-Rat** * Darmstadt, Herdweg 76 * Apparatuses for preparing crystalline Peroxide of Hydrogen. See p. 366.

1998 **Stassfurter Chem. Fabrik A.-G.** * Stassfurt * Possess various Gold Medals and Highest awards. Exhibit. of Potassium Cyanide, Potassium Cyanate, Ferrocyanide of Potassium and Urea. Also manufact.: Potassium Chloride, Potassium sulph., Kieserite, Magnesium sulph., Bromine and Magnes. Chlor. 500 workmen.

1999 **Prof. Dr. Stavenhagen** * Berlin-Grunewald, Humboldtstr. 5 * Various apparatuses, Inorganic preparations. See p. 367.

2000 **Dr. Stock** * Berlin, Hessische Str. 1/3 * Apparat. for work. with liquefied gases, Inorganic preparat. See p. 366 and 367.

2001 **Prof. Dr. Stoehr** * Kiel, Chem. Inst. der Universität * Preparations of the Pyrazine series. See p. 371.

2002 **Prof. Dr. Stoermer** * Rostock i. M., Georgstrasse 33 * Preparations of the Cumarone series. See p. 370.

2003 **Prof. Dr. Thiele** * Strassburg, Chem. Inst., Goethestr. * Preparations of Nitramide, Amido-guanidine, &c. See p. 369.

2004 **Prof. Dr. Thierfelder** * Berlin, Neue Winterfeldstr. 37 * Physiologico-chemical preparations. See p. 372.

2005 **Prof. Dr. Thoms** * Steglitz-Berlin, Hohenzollernstr. 3 * Plans, Apparat. See p. 372.

2006 **Prof. Dr. Tollens, Geh. Reg.-Rat** * Göttingen, Agrik.-chem. Laborat. * Apparatuses, Preparations of the sugar group. See p. 372 and 373.

2007 **Prof. Dr. W. Traube** * Berlin, Potsdamer Str. 5 * Synthesis of Uric acid and of Xanthine. See p. 369.

2008 **Vereinigte Chemische Werke** * Charlottenburg * Lanoline, Glycerine, Fatty acids. See p. 372 and 426.

2009 **Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H.** * Berlin, Chausseestr. 3 * Apparat. for Chemical laborat. See grps. 19, 23, 83 and 140 p. 365—368, 371—373, 426, 489 and 498.

2010 **Vereinigte Tonwarenwerke, A.-G.** * Charlottenburg, Sophienstr. 8/17 * Sink &c. for laboratories.

2011 **Prof. Dr. Vongerichten** * Jena, Villa Frankenhäuser * Decomposition of Morphine and of apiine. See p. 372.

2012 **Prof. Dr. Wallach, Geh. Reg.-Rat** * Göttingen, Chem. Inst. d. Universität * Collect. of V. Meyer's Apparat. for determ. Vapour Density, Preparations of the Terpene series. See p. 365, 366 and 370.

2013 **Dr. Wedekind** * Tübingen, Gartenstrasse 4/5 * Preparations illustrating Stereoisomerism of Nitrogen compounds. See p. 365, 367, 369 and 372.

2014 **R. Wedekind & Co.** * Ürdingen a. Rh. * Chemical Factory, Est. 1886 at Leichlingen near Elberfeld, removed in 1890 to Ürdingen a. Rh., employs at present 150 workmen. Manufact. alizarine for Turkey-red dyeing Industry, alizarine dyes and Intermediate products by own patens processes, resp. provisional specificat. Also manufact. Bichromates a. other Cromium salts of partic. kinds for Paint., Colour manufacturing and Tanning. In the group "Chemistry of the Germ. Educ. Exhibition" a number of new Sulphonic acids, Hydroxyl derivatives and Chlorine products of the Anthraquinone series, prepared by own patented methods resp. provisional patents applied for. See p. 370.

2015 **Prof. Dr. Weinland** * Tübingen, Neckarstr. 1 * Inorganic preparations. See p. 367.

2016 **Prof. Dr. Wichelhaus, Geh. Reg.-Rat** * Berlin, Gr. Querallee * Apparat., Naphthol preparations. See p. 366 and 370.

2017 **Prof. Dr. Windisch** * Geisenheim * Apparat. for the analysis of Wine. See p. 373.

2018 **Prof. Dr. Winkler, Geh. Hofrat** * Dresden, Terrassenufer 3 * Models, Germanium-preparations, Indium and Hydrides of the Metals of Rare Earths. See p. 365—367.

2019 **Theodor Wirsing** * Schweinfurt a. M. * Established 1833. Colours and Chemicals. Mineral-, Wood- and Aniline lacquer Colours. Export to all parts of the world. See p. 367. See advts. p. 5.

2020 **Prof. Dr. W. Wislicenus** * Tübingen, Universität * Apparatuses for Syntheses by means of Diethyloxalvacetate.

2021 **Prof. Dr. H. Wislicenus** * Tharandt, Kgl. Sächs. Forstakad. * Apparatuses, literary works. See p. 365, 366, 369 and 373.

2022 **Dr. L. Wöhler** * Karlsruhe * Autooxydation of Platinum. See p. 367.

2023 **Prof. Dr. Wohl** * Charlottenburg, Bleibtreustr. 49 * Gas Analysis, Inorganic and Organic preparations. See p. 365, 367, 369, 370 and 372.

2024 **Prof. Dr. Wolffenstein** * Charlottenburg, Techn. Hochschule * Inorganic and Organic preparations. See p. 365, 367, 371 and 372.

2025 **Carl Zeiss** * Jena * Refractometer, Spectroscopes, Microscopes. See grps. 19 and 140 p. 364, 369, 371, 373, 374, 376, 378, 380, 415, 498 and 500.

Collective Exhibition of German Perfumery Works.

Business Manager: Kgl. Kommerzienrat Leichner, Berlin.

2026 **Georg Dralle** * Hamburg und Altona * Manufactory of fine Perfumes and Toilet

soaps. Established 1852. Specialities: Dr. Dralle's Birch Hair-wash, "Sapodont" Dentifrice, "Violet-malattine" Cream for the Skin. Perfumes: Empress-Viktoria-Augusta-Violet and Lily of the Valley. Toiletsoaps: "Ohne Gleichen," Florida Violet, Irisflower.

See advertisements p. 5.

2027 **Jünger & Gebhardt** * Berlin S. 14 * Factory of fine Perfumes and Toilet soaps. Speciality: Lanoline Cream preparations. Established 1873.

2028 **B. Langwisch Nachf.** * Hamburg, Merkurstrasse 34 * Factory of Perfumery, Powder and Rouge.

2029 **L. Leichner** * Berlin SW., Schützenstr 31 * Steampower Works for Perfumery, Cosmetics, Powders and Rouges. Purveyor to the Royal theatres. Largest establishment in the world.

2030 **Vereinigte Chemische Werke, Aktiengesellschaft** * Charlottenburg bei Berlin * Glycerine of various qualities, Lanoline and Lanoline preparations, Ammonia, Fatty acids manufactured by fermentation. See grps. 19, 83 and 140 p. 365-368, 371-373, 425, 489 and 498.

2031 **F. Wolff & Sohn, Erste Karlsruher Parfümerie- und Toiletteseifenfabrik** * Karlsruhe (Baden) * Established 1857. Branch houses Berlin and Vienna. Printing, Embossing, Joiner's Department, Factory of Fancy boxes. 3 Steam-engines 300 H. P. 3 Dynamos and 14 Electromotors. 520 Labourers and Employees. Specialities: Kaloderma for the skin, Odonta for the teeth, Black Forest Pine preparations. 7 Prize Medals at International Exhibitions, Gold Medal Paris 1900, Diploma of Honour of Prince Kotohito of Japan, Osaka 1903. Wholesale Depots and Export Representatives at all European and Transatlantic capitals.

In the German Hygiene Exhibition.

See Social Economy p. 494 and 500.

2032 **Kaiserliches Gesundheitsamt** * Berlin. See grps. 26 and 141 p. 428 and 500.

2033 **Chemisches Untersuchungsamt des Kgl. Polizeipräsidiums** * Berlin.

2034 **W. C. Heraeus** * Hanau a. M.

2035 **Prof. Dr. G. von Hüfner** * Tübingen.

2036 **Kgl. Porzellanmanufaktur** * Berlin.

2037 **Fritz Köhler, Universitätsmechaniker** * Leipzig.

2038 **A. Krüss, Optisches Institut** * Hamburg.

2039 **E. A. Lentz** * Berlin * Factory for Laboratory fittings.

2040 **Otto Pressler, Fabrik wissenschaftlicher Apparate** * Leipzig.

2041 **F. Sartorius, Fabrik wissenschaftlicher Präzisionsinstrumente** * Göttingen and Rauschenwasser.

2042 **Schmidt & Haensch, Optisch-mechanische Werkstätten** * Berlin.

2043 **Schott & Genossen, Jenaer Geräte und Röhrengläser** * Jena.

2044 **Vereinigte Fabriken für Laboratoriumsbedarf, G. m. b. H.** * Berlin.

Single Exhibitors.

2045 **Berliner Ceresinfabrik Graab & Kranich** * Rixdorf * Ceresine, Carnauba wax, Ozokerite, Lanoline and allied products.

2045a **Amber-Exhibition.** See p. 431, 432.

2046 **Paul Horn, Chem. Fabrik** * Hamburg-Eilbeck * Established 1879. Factory for Spirit- and Oil-varnishes, dead varnishes, Enamel- and glaze-Dipvarnishes, Polishes, Stains, Glue and Polishing materials.

2047 **Alex Junkers, Farbentechniker** * Berlin SW. * Factory of weather-proof Normal Mineral colours for painting and grounding, weather-proof, washable and unfading. See grp. 28 p. 437.

2048 **Ölwerke Stern-Sonneborn, Akt.-Ges.** * Hamburg * White Vaselines, white Vaseline oils, Dressing oils, Turkey Red oils.

2049 **Fritz Schulz jun., Akt.-Ges.** * Leipzig, Eger, Neuburg * Chemical Works with own factories for Tinplate- Packing boxes, Card-board boxes and wooden boxes. Largest Metal-polish Works in the world. Share Capital 5,100,000 M. Specialities: Globe Metal Polish, Globe Liquid-Polish, Glass Cleaner, Silver powder, siliceous Chalk. Solid and liquid "Globin" Leather polish. Brilliant Starch, Furniture polish, also various chemical technical products here exhibited. Directions for use in all languages. Yearly sale of Globe Metal Polish about 80 million tins. Own mines with Steam Sedimentation Works for obtaining the raw material (siliceous chalk) for Metal polishes. Gold Prize Medals awarded, the last one at the Paris Exhibition of 1900 (Collective Exhibition of German Chemical Industry). Trade mark: "Red stripe with Globe." Agents for U. S. A.: Raimes & Co., New York, 50 Ferry St.

2052 Vereinigte Glanzstofffabriken A.-G. * Elberfeld * Lustrous fabric i. e. artificial Silk. See grp. 57 p. 467.

Group 24.

Manufacture of Paper.

2053 Robert Dietrich, Inhaber der Firma Gebr. Dietrich, Papierfabrikant * Merseburg * Employs 350 Workmen, and produces daily 25,000 kg of Paper of all kinds, 15,000 kg of Cellulose, in its Factory for machinery manufactures its own Patent apparatuses for making Paper and Cellulose, of which apparatuses 550 have up to the present been sold.

2054 Ferd. Emil Jagenberg * Düsseldorf * Established 1878. Awarded Düsseldorf 1902: Silver State-Medal. 1. Engineering Works. Speciality: Machines for the Paper-Industry, for Bookbinders and Paper-Box-Makers. Automatic Box Machine, Automatic Labelling Machine for bottles, tins, parcels, &c., Automatic Tube Making Machine, Glueing-, Gumming- and Varnishing-Machines, Box Topping and Covering Machine, Paper Slitter and Rewinder, Automatic Book Cornering Machine. 2. Roll Paper Works: Narrow Paper-Coils, Morse Tapes, Serpentines and Confetti. See grp. 28 p. 437.

2055 Otto Metz & Co. * Cöln a. Rh. * Paper plates and serviettes for the Restaurant of the German State Building.

2056 Reichsdruckerei * Berlin * Hand-made paper with artistic water marks. See grps. 14, 15 and 17 p. 402, 404 and 410.

Group 25.

Civil and Military Engineering.

2057 Heinrich Brink, Motor-car Factory * Wahlershausen-Cassel * See grp. 141 p. 500 and Education Exhibition p. 388.

2058 Cordes & Co. * Hannover * Mining buildings. See grp. 116 p. 493.

2059 Weber-Falckenberg * Berlin * Firm established in 1876. Inventor and sole manufacturer of fire proof impregnated waterproof Linen fabrics for roofing, excellent for covering in military-, railway-, factory- and agricultural buildings. Exhibition buildings without tiles. Covering of roof and wall surfaces of portable Barracks and Houses, acid proof for interiors of factories in which vapours ascend. Absolute protection of ceilings. Prevents condensed vapours from dropping down. 12 Gold and Silver medals. 1901 Large Silver State-medal. Wholesale manufacture of elastic roofing-felt (with Tropical outfits, Isolating plates, Wood cement, &c.). See German State Building p. 362.

Group 26.

Models, Plans and Designs for Public Works.

Joint Exhibition of the Royal Prussian Ministry of Public Works in Berlin.

2060

(A special Guide and Catalogue of the Collective Exhibition has been issued.)

Models, Drawings, Photographs, Instruments, Publications relating to Hydranlic engineering, in particular Hydrographical undertakings; Levelling and Water-mark departments, Break waters, Ice breakers, and canal traffic. Testing of natural building stones as to their weather resisting qualities, Investigations about the resistance of Ships and about Shipping; Statistics, River correction, Harbour works, Bridge building and Lighthouses, &c. Further with the collaboration of:

Aktiengesellschaft "Weser" * Bremen * 2061
Drawing of the Lightship "Borkumriff."

Haniel & Lueg * Düsseldorf * Engineering, Iron and Steel Works. Established 1873. About 2,000 Workmen. Model, Drawings and Description (specially printed) of the Machinery for raising ships at Henrichenburg on the Dortmund-Ems-Canal, for raising ships with 600 tons freight up to a 16 m higher level. 2062

Prof. Dr.-Ing. O. Intze, Geh. Reg.-Rat * Aachen * Preparatory works, Building and Employing of dammed up Valleys for Water supply and Power stations, also for protection against Inundation in Rheinland and Westfalen, Schlesien and Bohemia, Samples of stones and mortar. Model of the Urf Valley Reservoir near Gemünd. 2063

J. W. Klawitter * Danzig * Model of a Twinscrew Dredger Barge, with bottom plates and watertight compartments. 2064

Lübecker Maschinenbaugesellschaft * Lübeck * Factory established in 1845, Joint-stock Company since 1873. Engineering Works with grey and case hardened Iron Foundry, Boiler and Shipbuilding Work. 500 Workmen. Models and Drawings: Marine bucket- 2065

dredger, Shaft suction-dredger, Dry dredger. See advertisements p. 21.

2065a Gebrüder Sachsenberg, G. m. b. H. * Rosslau i. Anhalt * Drawing of a Twin-serew steamer and Suction-dredger. See advertisements p. 26.

2066 Schiffs- und Maschinenbau-Aktiengesellschaft * Mannheim (Baden) * Shipyard, Engineering Works, Boiler Factory, Foundry. Established 1853. 500 Workmen. Dredgers and Elevators for Dredging purposes. Steam yachts and Tugs in models and photographs.

2067 Siemens-Schuckert-Werke, G. m. b. H. * Berlin * Photographs and drawings of the Heligoland Lighthouse.

2068 Kreis Teltow (Teltow-Kanalbauverwaltung) und Havestadt & Contag, Kgl. Bauräte * Wilmersdorf-Berlin, Berliner Str. 157 * Construction of the Teltow Canal; Models, Drawings and Photographs of the Double-lock at Klein-Machnow.

2069 Vereinigte Maschinenfabrik Augsburg * Gustavsburg * Picture of the new bridge across the Weser at Nienburg.

German Hygiene Exhibition.

See Social Economy p. 494.

2070 Kaiserliches Gesundheitsamt * Berlin * See grps. 23 and 141 p. 426 and 500.

2071 Götze, Direktor der Wasserwerke * Bremen * Model with drawing of a Plant for double-filtration.

2072 Fahrzeugfabrik Heinrich Brink * Cassel-Wahlershausen.

2073 Siemens & Halske * Berlin.

Single Exhibitors.

2074 Continentale Gesellschaft für elektrische Unternehmungen * Nuremberg * Drawings of projected and existing Monorail Hanging Railways. See grp. 74 p. 474.

2075 North German Lloyd * Bremen * Model of the new fireproof Pier of the North German Lloyd in Hoboken N. J. (Harbour of New York). See grp. 75 p. 475.

2076 Siemens & Halske, A.-G. * Berlin SW., Askanischer Platz 3 * Model of the Triangle of the Berlin Elevated and Underground Railway.

Group 27.

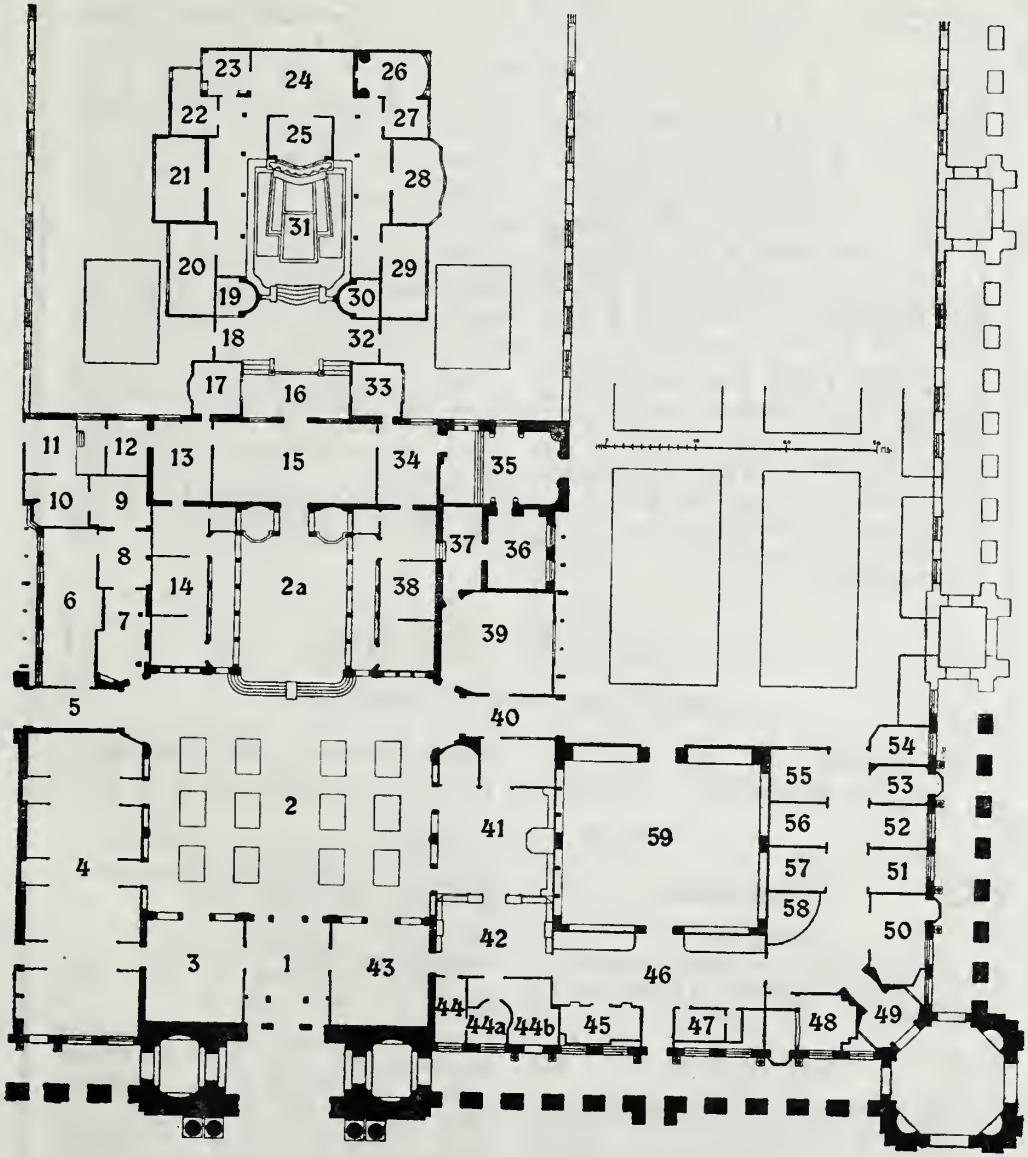
Architectural Engineering.

2077 Boswau & Knauer, G. m. b. H. * Berlin, Branch establishments in Cologne, Hamburg, Hanover, St. Louis, New York * 5 000 Workmen, 200 Buildings and Plants carried out yearly, 12 Medals and Prizes, Carried out and exhibited at St. Louis: a) Buildings: On our patented Special systems which often obtained Prizes, Masonry of the German House including Terraces and Pergolas of the German Restaurant, of the German-Tyrolese Alps and of the German Industrial Arts Department. Also single Exhibits: Porcelain Manufacture, Ministry of Education, State Railways, Bavarian Industrial Art Groups, South West German States, &c. See German State Building p. 359 and 362, German-Tyrolese Alps p. 506. b) Models: German State Building, German-Tyrolese Alps, Agricultural Home for Youth "Königin-Luise-Andenken." c) Sculptural work: Great Frieze of Industrial Arts Department, Sketches, Figures, Sculpture, Stucco ceilings Terrazzo floors. See grp. 37 p. 447. d) Drawings, Photographs, albums of finished Buildings and Plants.

Department D.
Industrial products.
(Palace of Varied Industries.)

1. Vestibule * 2. Large Hall * 2a. Hall of Honour * 3. Royal Porcelain Manufactory, Berlin * 4. Bronze Hall * 5. Passage * 6. Reading room of the Düsseldorf Town Library. Prof. Peter Behrens, Düsseldorf * 7. Hall of an Art connoisseur. Curt Stoeving, Berlin * 8. Reception Room. Prof. Alfred Grenander, Berlin * 9. Parlour. Prof. Alfred Grenander, Berlin * 10. Nursery with Bedroom. Arno Körnig, Berlin * 11. Dining room. Anton Huber, Berlin * 12. Boudoir.

Plan of the German Industrial Arts Department in the Palace of Varied Industries.



Rudolph and Tia Wille, Berlin * 13. Headmaster's Room of the New Industrial School at Nuremberg. Richard Riemerschmid, München * 14. Passage. Architectural Drawing and Designs * 15. State room of Bavarian Industrial Art (Landrat's Hall of the Bayreuth Gouvernment Building). Prof. Martin Dülfer, München * 16. Front court. Prof. Martin Dülfer, München * 17. Reading room. Bertsch & Niemeyer, München * 18. Badenese Entrance hall * 19. Ante-rooms. Prof. Max Läuger, Karlsruhe * 20. Sitting room. Prof. Max Läuger, Karlsruhe * 21. Gentleman's room. Carl Spindler, St. Leonhard bei Börsch i. E. * 22. Tea-room * 23. Library * 24. Grey sitting-room * 25. Dining-room * 26. Music-room * 27. Smoking-room (22 to 27: Prof. Joseph Olbrich, Darmstadt) * 28. Music-room. Prof. B. Pankok, Stuttgart * 29. An art collector's reception room * 30. Ante-room to an art collector's reception room * 31. Courtyard with basin for water. Prof. Joseph M. Olbrich, Darmstadt * 32. Baden ante-room * 33. President's study for the Government Buildings at Bayreuth. Bruno Paul, München * 34. The President's Reception-room for the Government Buildings at Bayreuth. Gebrüder Rank, München * 35. Music-room. Fritz Drechsler, Leipzig * 36. Reception-room of the Saxon House of Assembly at Dresden. Prof. W. Kreis, Dresden * 37. Ante-room with exhibition of Saxon objects of art. Prof. W. Kreis, Dresden * 38. Architectural drawings and designs * 39. Music-room. Prof. H. Billing, Karlsruhe * 40. Passage (Exhibition of Placards) * 41. Toy-room * 42. Amber room * 43. Orivit-Aktiengesellschaft, Köln * 44. Commercial Bureau of the Imperial Commissioner * 44a. Consulting-room of the Commercial Bureau. Prof. Peter Behrens, Düsseldorf * 44b. Waiting-room of the Commercial Bureau. Prof. Peter Behrens, Düsseldorf * 45. Study. Magdeburg Group of Artists * 46. Gobelin room * 47. Saloon-cabin on a Norddeutsche Lloyd steamer. W. Kümmel, Berlin * 48. Reception-room. Leo Nachtlicht, Dipl.-Ing., Berlin * 49. Hall * 50. Exhibition of the Künstlerinnen und Kunstfreundinnen in Berlin * 51. Room for a young lady. Arthur Biberfeld, Berlin * 52. Dining-room. Altherr & Ortlieb, Berlin * 53. Drawing-room. Marie Kirschner, Berlin * 54. Builder's office * 55. Drawing-room from the year 1813. C. Prächtel, Berlin * 56. Bedroom of the Biedermeier period. P. Ecke, Schmidt & Co., München * 57. Room of a collector of leather work. Georg Hulbe, Hamburg * 58. Imitations of old German silver objects (now in the possession of Harvard University) * 59. Ceramic-room.

1. Joint Exhibitions, comprising several groups.

a) Exhibit of the precious metal industry of Hanau.

Manager: Prof. M. Wiese, Direktor der Kgl. Zeichenakademie, Hanau a. M.

(Groups 11, 30 and 31.)

Group 11.

Sculpture.

2088 Otto Glenz, Elfenbeinschnitzer * Erbach i. Odenwald * Figures and bowls carved in ivory.

Group 30.

Silversmith's and goldsmith's ware.

2089 Gebrüder Glaser * Hanau a. M. * Silverware Factory. Speciality: Antique objects. Large and small silver-ware of all kinds. Established 1883.

2091 Königl. Zeichenakademie, Klasse für Emailmalen, Lehrer Hahn * Hanau a. M. * Objects enamelled on metal, and painted on enamel and ivory.

2092 Königl. Zeichenakademie, Werkstatt für Graviertechnik, Lehrer R. Wolff * Hanau a. M. * Articles of silver, engraved enamelled, and Tula metal work.

2093 Königl. Zeichenakademie, Bijouterie-werkstatt, Lehrer L. Beechor * Hanau a. M. * Articles wrought in gold and

silver with enamel and precious stones, from designs by the Jewellery Designing class, Teacher H. Naas.

2094 Königl. Zeichenakademie, Ziselierwerkstatt, Lehrer Prof. Offterdinger * Hanau a. M. * Articles wrought in silver, for private use.

2095 Joh. Martin Krug Nachf. * Hanau a. M. * Enamel, articles of jewellery.

2096 Ludwig Neresheimer & Co. * Hanau a. M. * Silver vessels, from old masters.

2097 Ott & Cie. * Hanau a. M. * Silver ware; Glass and Porcelain ware with galvanised silver mountings.

2098 J. D. Schleissner Söhne, Silberwarenfabrikanten * Hanau a. M. * Speciality: work in antique style.

2099 Bernhard Wenig * Hanau a. M. * (Design) Silver Tea Service (Executed by Neresheimer & Co.).

2100 Prof. M. Wiese, Direktor der Königl. Zeichenakademie * Hanau a. M. * Silver and Ivory figures with gold ornamentation, set with enamel and jewels. Collaborators: O. Glenz, Erbach i. O., Ornaments from L. Beschor.

Group 31.

Jewelry.

2101 Peter Deines Söhne * Hanau a. M. * Manufacture of fine trinkets.

2102 C. Hertel & Sohn, Hofjuweliere * Hanau a. M. * Established 1837. Manufacture of fine jewellery and gold ware. Speciality: artistic employment of Barock pearls, objects of art and fancy in gold, silver and enamel. Awarded prizes at Industrial Exhibitions at Kassel 1870, Vienna 1873, München 1876, Philadelphia 1876, Melbourne 1880, Nürnberg 1885, München 1888, London 1891, Scheveningen 1893, Chicago 1893.

Wilh. Ihm * Hanau a. M. * Ornaments of precious metals with stones and enamel. 2103

Fr. Kreuter & Co. * Hanau a. M. * Speciality: Jewellery, fine gold trinkets. Various ornaments. 2104

Joh. Martin Krug Nachfolger * Hanau a. M. * Manufacture of Jewellery. Atelier for enamelling. Established 1848. Awarded numerous prizes at first-class Exhibitions. 2105

J. Sachsenweger * Hanau a. M. * Goldwarenfabrik. Speciality: Gold chains of all kinds. Established 1840. Driven by electricity. 2106

Gebrüder Schatt * Hanau a. M. * Manufactory of Jewellery. Speciality: fine Gold jewellery, Rings, Pins, fancy articles, &c. 2107

Ernst Schönfeld junior * Hanau a. M. * Manufactory for fine and gold ware. Established 1840. Necklaces, brooches, rings, articles in dull gold and jewellery. 2108

Steinheuer & Co. * Hanau a. M. * Founded 1838. Manufacture of fine ornament of gold and jewellery. Superfine and fine quality. Gold brooches set with precious stones. 2109

Bernhard Wenig, Teacher at the Royal Academy of Drawing * Hanau a. M. * Design for ornaments in gold and platina with precious stones, executed by F. Kreuter. 2110

H. Zwernemann * Hanau a. M. * Manufacture and Export of gold and silver ware in every variety. Illustrated catalogue in all commercial languages. 2111

b) Exhibit of the Amber Industry, by the Royal Prussian Ministry of Trade and Industry.

Manager: Prof. Dr. R. Klebs, Königsberg i. Pr.

(Groups 14, 23, 31, 32, 34, 41 and 116.)

Group 14.

Original objects of Art Workmanship.

2114 Fritz Fehrmann, Goldschmied * Tilsit (Ostpreussen). Ornaments and productions in precious metal with real amber. Awarded Prize medals: Tilsit 1891, Königsberg 1895.

Group 23.

Chemical and Pharmaceutical Arts.

Hermann Schwarz * Magdeburg * Manufacture of all kinds of oil and spirit varnish. Established 1861. Awarded Gold Medal Paris 1900, and Grand Prix in the Collective Exhibit of the 2115

Amber Industry. Speciality: Amber varnishes, shown in liquid samples for industrial purposes and house-painting. The firm constantly supplies the Royal Railway and Military Authorities, the Imperial Navy. Ship-building yards, and Industries of the most varied kinds at home and abroad.

2116 **Carl Tiedemann** * Dresden * Oldest Amber Varnish Manufactory. Founded 1833. Speciality: Tiedemann's quick-drying, colored Amber Varnish for floors, an important hygienic factor in living rooms, also Amber Enamel varnish paints. Samples and specimens of both articles. In tins for export with German, French, English, Spanish, Italian, and other labels. Gold medal Paris 1900.

Group 31.

Jewelry.

2117 **Fritz Fehrmann, Goldschmied** * Tilsit (Ostpreussen) * Ornaments and Works of Art in precious metal with real amber. Medals awarded: Tilsit 1891, Königsberg 1895.

2118 **Paul Hübner** * Berlin, Markusstr. 5 * Manufacture of Sleeve-links, Brooches, Pins.

2119 **Aug. F. Richter** * Hamburg * Manufacture of jewellery. Established 1846. 400 Employees. Manufacture of personal ornaments, artistically executed in gold, silver, gold-plated, &c. from original designs by famous artists. Novelties constantly. Many patented systems. Large Export. Sole representative: F. Rosenstern & Co., New York, 85 Leonard Street.

2120 **Fr. Rosenstiel, Hoflieferant** * Berlin NW., Unter den Linden 48 * Artistic and commercial articles in Amber.

2121 **A. Zausmer** * Danzig, Langgasse 10 * Manufactory of Amber Goods. Established 1876. 18 Prize medals. Exposition Universelle Paris 1900 Grand Prix.

Group 32.

Clock and Watch making.

2122 **Etzold & Popitz** * Leipzig * Established 1864. Manufactory of modern house clocks, about 200 workmen. 10 Prize medals, the most recent Leipzig 1897, Berlin 1903. Specialities: Wall clocks, table or hanging clocks, time-pieces, house-clocks (also with chimes) in all prices and styles to the finest productions of art and industry. Sample stores or representatives in Leipzig, Berlin, Cöln, Paris, Athen, Madrid, Apeldoorn (Holland).

2123 **Louis Müller & Co.** * Biel (Schweiz) * Watch Manufactory. All kinds of watches in $10\frac{1}{2}'''$ (00 size). Steel, silver and gold. Speciality: Fancy amber cases from Königsberg i. Pr.

Group 34.

Fancy Goods.

2124 **A. Lehmann** * Königsberg i. Pr., Steindamm 79/80 * Turnings and carvings in Amber, Ivory, and Wood. Many Prize medals.

2125 **Fr. Rosenstiel, Hoflieferant** * Berlin NW., Unter den Linden 48 * Established 1825. Artistic and useful articles in Amber.

2126 **Vereinigte Pfeifenfabriken vorm. Gebh. Ott & Ziener und Ellenberger A.-G.** * Nürnberg * Employs about 200 persons and manufactures tobacco pipes of Bruyère wood, cigar- and cigarette-holders of Amber, Ambroid, &c. Export to all countries. Firm of Gebh. Ott, established 1865. Awards: Philadelphia 1876, Wien 1873, Nürnberg 1882, Leipzig 1880 and Amsterdam 1883.

2127 **A. Zausmer** * Danzig, Langgasse 10 * Manufactory of Amber Goods. Established 1876.

Group 41.

Hardware.

2128 **Adolf Amsberg** * Aachen * Bronze door-handles and window-handles in combination with amber, ivory, buffalo-horn, &c.

Group 116.

Minerals and Stones, and their utilization.

2129 **Adolf Amsberg** * Aachen * Bronze door-handles and window-handles in combination with amber, ivory, buffalo-horn, &c.

2130 **Prof. Dr. R. Klebs,** Kgl. preuss. Landesgeologe * Königsberg i. Pr. * Rare finds of amber, animal and vegetable remains embedded in amber. See p. 431.

2131 Königliche Bernsteinwerke * Königsberg i. Pr. * Amber in the rough, Ambroid (Pressed Amber), liquefied Amber, Amber Oil and Amber acids. Fine specimens.

2132 A. Lehmann * Königsberg i. Pr., Steindamm 79/80 * Amber, Ivory, and Wood Turning and Carving. Many prize medals.

Fr. Rosenstiel, Hoflieferant * Berlin NW., Unter den Linden 48 * Established 1825. Artistic and useful articles in amber. 2133

c) Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen" * Berlin.

Management: Marie Kirschner * Berlin W. (room 50).

(Groups 9 to 11, 14, 30, 31, 33, 37, 38, 43 and 58.)

Group 9.

Paintings and Drawings.

2136 Mathilde Block-Niendorff * Berlin, Bülowstr. 104 * Miniatures on Ivory: Portraits of his Majesty the Emperor and her Majesty the Empress.

2137 Gertrud Burger, Portrait painter * Berlin, Tauenzienstr. 10 * Miniatures on Ivory: Portraits, Head after Boucher, "Nymphe," Original.

2138 E. von Eicken * Halensee (Berlin), Hohbrechtstr. 10 * Faience Plates, painted before glazing. Landscapes and Marine paintings in dark blue frames.

2139 Claire v. Gersdorff, Hofdame Ihr. M. der Kaiserin * Potsdam * Original Sketches from Life: His Majesty the Emperor, His Imperial Highness the Crown Prince, &c.

2140 Anna Höchstedt * Berlin, Burggrafenstrasse 12 * Miniature on Ivory, "Frauenkopf," in black wooden frame.

2141 Dorothea Kellner * Berlin, Altonaer-Str. 16 * Enamelled miniature Portraits on Ivory.

2142 Bertha von Kitzing * Berlin, Regensburger Str. 2 * Porcelain: Tête-à-tête in the style of Frederick the Great, painted from old designs.

2143 Emmy Luthmer * Berlin, Uhlandstrasse 44 * Enamel paintings.

2144 Emma Wirth * Stuttgart, Gaisburgstrasse 4a * Service painted blue on white ground.

Group 10.

Engravings and Lithographs.

2145 Clara Elisabeth Fischer, Artist * Berlin, Potsdamer Str. 121a * Lithographs. Atelier for lady students in all branches of art.

Anna Lent, Artist * Berlin W. * Artistic Placards: 1 Placard for a Periodical, 1 Placard for Pianos in Distemper. 2146

Emma Lobedan * Berlin, Hafenplatz 5 * Original Etching of Castle Rheinsberg with tarsia work frames. 2147

Cornelia Paczka-Wagner * Berlin, Lützowstr. 60 * Etchings. 2148

Bertha Schrader * Dresden, Christianstrasse 19 * Coloured Lithograph of the old Augustusbrücke in Dresden. 2149

Gertrud Stechow * Friedenau (Berlin), Rembrandtstr. 11 * Etchings. 2150

Group 11.

Sculpture.

Cornelia Paczka-Wagner * Berlin, Lützowstr. 60a * A Bronze. 2151

Helene Quitmann, Bildhauerin * Berlin, Passauer Str. 5 * Bronzes, upright Candlesticks, Sconces, Electric bell knobs, Statuette of boy, Fountain for a room. 2152

Group 14.

Original Industrial Art Work.

Elisabeth Ankermann * Berlin, Uhlandstrasse 48 * Writing cases in real leather, slightly toned, embossed and stained. 2153

Zdenka Braunerova * Roztek b. Prag * Liqueur service of Bohemian glass, painted with enamel colours before burning. 2154

Henny Deppermann * Berlin, Nettelbeckstr. 24 * Fans painted on white silk, "Nixen im Mondschein." Awarded medals München, Chicago, Lübeck, Berlin. 2155

Margarethe Erler * Berlin, Viktoria-Luise-Platz 5 * Fans, painted and worked in lace. Fans painted in correct style for antique frames. 2156

2157 Clara Goldmann * Berlin, Martin-Luther-Str. 84 * Mirror in red mahogany frame with tarsia work of flying sea-gulls.

2158 J. Hansing * Hannover * Schule für Malerei u. Kunstgewerbe. Speciality: Leather-work. Elegantly bound Bible with coloured and hand-worked leather binding with artistic lock.

2159 Anna Höchstedt * Berlin, Burggrafenstrasse 12 * Fans.

2160 Marie von Keudell, Lady landscape artist * Berlin, Königgrätzer Str. 31 * Screen. Mahogany frame with 3 pastel drawings. Views of the upper Spree, Havel and Potsdam.

2161 Marie Kirschner * Berlin, Steglitzer Str. 21 * Glass vases and artistic glasses.

2162 Hildegard Lehnert und Clara Lobedan * Berlin W. * Artistic Ceramics, Stoneware vases with smooth glazing and with galvanic precipitation.

2163 Marie Victoria Peller * Berlin, Lützowstrasse 111 * Award Prize Karlsruhe. Exhibition of Fans. Fan: Red-currants. Fan: Chasing Butterflies.

2164 Ilse Schütze, Artist * Charlottenburg * Folding-screen with painted frieze of heads of praying children. Groundwork with poppy ornamentation by Clara v. Sivers.

2165 Clara von Sivers * Halensee (Berlin), Georg-Wilhelmstr. 19 * Hand-weaving "Flying sea-gulls" on grey ground.

2166 Sylter Hausfleissverein * Insel Sylt * President: Exzellenz von Versen, Berlin. Woven woollen rugs and cushions in Scherrebeker style.

Group 30.

Silversmiths' and Goldsmiths' Ware.

2167 Dorothea Kellner * Berlin * Altonaer Str. 16 * Enamel miniature portraits on copper and silver.

Group 31.

Jewelry.

2168 Ilse v. Cotta * Berlin, Potsdamer Str. 39 * Ornaments in wrought silver and decorated with half-precious stones. Original work.

Group 33.

Productions in Marble, Bronze, Cast-Iron and Wrought-Iron.

2169 Hedwig v. d. Gröben * Pau, Südfrankreich * Chest made of wrought metal, Sconce of wrought brass, watch in embossed case with metal ground.

2170 Marie Kirschner * Berlin, Steglitzer Str. 21 * Umbrella-stand of dull-polished brass fitted with blue-green Tiffany glass.

2171 Lina Krause * Berlin, Burggrafenstr. 12 * Book-slides of wrought-iron, brass, copper, and pinch-beck.

2172 Elisabeth Neelsen * Berlin, Kurfürstenstrasse 73 * Wrought-iron two-armed candlestick.

2173 Sophie Luise Schlieder * Berlin, Kleiststrasse 40 * Lamps, the bulb under mother-of-pearl shells. Music-stand of bronze, Metal Bell with mock-jewels.

Group 37.

Decoration and fixed Furniture of Buildings and Dwellings.

2174 Gertrud Wunder * Jena, Ziegelmühlenweg 15 * Spinning-wheel and stool richly scalloped, of dark-brown stained wood.

Group 38.

Office and household Furniture.

2175 Maria von Brocken * Berlin, Lützowplatz 12 * Glass-cupboard of mahogany with wood-carvings and bronze fittings in Empire style.

2176 Baronesse M. v. Buddenbrock * Berlin, Eisenacher Str. 112 * Tea-table and chair of satin-wood with tarsia work. Table with undershelf and small flaps.

2177 E. Dillmann, Artist * Charlottenburg, Fasanenstr. 24 * Double chairs with carved back and seat (Ornamentation: Roman ivy). Polished mahogany.

2178 Freifrau Mary von Falkenstein, geb. Garraway * Berlin, Potsdamer Str. 20a * Music cupboard, grey oak with silver-tin fittings.

2179 Clara Elisabeth Fischer, Artist * Berlin, Potsdamer Str. 121a * Small pillared cupboard of grey wood, iron mountings on the doors.

2180 Marie Kirschner * Berlin, Steglitzer Str. 21 * Book-stands with metal mountings and handles. Chairs, rests, &c., table.

2181 Lina Krause * Berlin, Burggrafenstr. 12 * Oak Book-case with iron mountings on the doors. Tea-table, mahogany with flat carving.

2182 Hildegard Lehnert und Clara Lobedan * Berlin * Wooden partition in grey oak inlaid. Tables of grey wood with tops of etched glass.

2183 Hanna Mehls, Artist for Trade and Artistic purposes * Berlin, Wittenbergplatz 3 * Writing-desk chair of mahogany with bronze work on the arms.

2184 Elisabeth Neelsen * Berlin, Kurfürstenstrasse 73 * Mirror in grey wood.

2185 Maria Philip, Furniture Designer * Berlin, Wichmannstr. 14 * Show-case coated with brown Martin varnish.

2186 Elisabeth Schellbach * Friedelshof bei Königs-Wusterhausen * Workshops for plain house-furniture, book-decoration and exlibris. Tea-table with tarsia work.

2187 Sophie Luise Schlieder * Berlin, Kleiststrasse 40 * Sofa of grey oak with tarsia work. Palm-stand. Table with glass tops.

2188 Ilse Schütze, Artist * Charlottenburg * Sideboard of mahogany in Biedermeier style with tarsia work.

2189 Margarethe Vorberg * Bugeshalde bei Neu-Babelsberg (Berlin) * Grey wood chair upholstered in cloth, studded with nails.

Group 43.

Carpets, tapestries, and fabrics for upholstery.

2190 E. v. Elcken * Halensee (Berlin), Hobrechtstrasse 10 * Gobelins painted from nature. Decorative forest interiors.

Martha und Hedwig Endell * Wilmersdorf, Durlacher Str. 11 * Carpet, made by the artists themselves. 2191

Group 58.

Lace embroidery and trimmings.

Martha und Hedwig Endell * Wilmersdorf, Durlacher Str. 11 * Curtain of tulle and coloured silk with embroidery. 2192

Helen Iversen * Berlin, Nettelbeckstr. 5 * Half worked and half painted cloth, an ear-pattern, made by the exhibitor. 2193

Marie Kirschner * Berlin, Steglitzer Str. 21 * Grand-piano-cover, chenille-embroidery with silver-spangles. Screen, embroidered and painted. Curtain with poppies. 2194

Lina Krause * Berlin, Burggrafenstr. 12 * Embroidered curtain, made by Marg. Helbig and E. Oesten, Berlin, Wilhelmstrasse 128. 2195

Emmy Luthmer * Berlin, Uhlandstrasse 44 * Embroidered velvet hangings, appliqué of velvet and silk bordered with rope-work. 2196

Freifrau von Maltzahn * Spandau, Stresow 16 * Table-cloths, table-centres, and cushions, worked on silk and linen. 2197

Clara von Sivers * Halensee (Berlin), Georg-Wilhelm-Str. 19 * Screen: Peacock in silk-embroidery on three-fold carved screen. Embroidery. 2198

Emma Wirth * Stuttgart, Gaisburgstrasse 4 A * Blue and white worked table-cloth. 2199

d) Exhibit of the "Vereinigte Werkstätten für Kunst im Handwerk, G. m. b. H." * München.

Show-case containing small artistic objects in precious metals, bronze, ivory, and wood, from designs and models by various artists.

(Groups 11, 14, 30, 31, 32 and 33.)

Group 11.

Sculpture.

2202 Eugen Berner * Seal "Das Schweigen," carved in wood.

2203 Sophie Burger-Hartmann * Small plastic articles in ivory and silver, silver and bronze.

Fritz Christ * "Judith," Bronze on serpentine pedestral. 2204

Theodor von Gosen * Bronze-statuettes: "The Bather," "Jewel-bowl," "Baby." 2205

Prof. Karl Gross * Carved ivory: Paperknife, seal, candlestick, memorandum-block. 2206

2207 Prof. Ludwig Habich * "Reading Desk," "Water Sprite," "Rock goat," "Nixie," "Key", (Bronzes).

2208 Ulfert Janssen * "Mermaid," Bronze Candlestick.

2209 Hugo Kaufmann * "Mirror," Bronze on onyx stand.

2210 Ludwig Kindler * "Jewel bowl," "Young faun" (bronzes).

2211 Prof. Ignatius Taschner * Bronze statuette "Boy Lying."

2212 Else Welgel * "Female figure," bronze.

Group 14.

Original Specimens of Art Workmanship.

2213 Prof. F. A. O. Krüger * Ornamental Glass, blown in front of a flame.

2214 Else Sapatka * Jewel-case in maple-wood with silver-plated mountings.

2215 J. J. Scharvogel * High temperature ceramics, with flowing glazing.

Group 30.

Silversmiths' and Goldsmiths' Ware.

See p. 434.

2216 Markus Behmer * Champagne cup in silver with etched ornamentation.

2217 Eugen Berner * Silver Tea-Service; Cup with Tula-work.

2218 Theodor von Gosen * Silver Epergne; Serviette Ring.

2219 Paul Haustein * Candlestick and Boxes in enamelled silver. Enamelled vessels set in silver and bronze.

2220 Meta Honigmann * Wine-jug, enamel with silver mounting; Flower stands, enamel with bronze mounting on wrought iron stands.

2221 Ludwig Kindler * Inkstand, enamel with silver setting.

2222 Richard Riemerschmid * Silver knife, fork, and spoon

2223 Else Sapatka * Lorgnon in silver and enamel, Serviette Rings, Cups, Silver Stoppers, Enamelled Vases set in Bronze.

Group 31.

Jewelery.

2224 Sophie Burger-Hartmann * Silver Brooches and Belt-Clasps.

2225 Max Daslo * Silver Brooches.

2226 Theodor von Gosen * Silver Brooches and Clasps.

2227 Prof. Karl Gross * Gold and Silver Brooches and Necklaces set with stones.

2228 Paul Haustein * Silver necklace set with stones, Brooches, Clasps, Pendants.

2229 Hermann Hirzel * Gold Brooches set with Stones Enamel.

2230 Meta Honigmann * Necklaces, Brooches, Clasps; Silver Studs and Box with Stones or Enamel.

2231 Prof. F. A. O. Krüger * Silver clasp with Brilliants and Opals.

2232 Hermann Obrist * Wrought Silver Belt-Clasp with green Spinelle.

2233 Else Sapatka * Cloak Clasp, Bracelet.

2234 Theodor Schmuz-Baudiss * Silver Brooch.

2235 Prof. Ignatius Taschner * Silver Brooch.

Group 32.

Watch and Clock making.

2236 Ferdinand Morawe * Timepieces with metal Dial-Plate, in Carved Wood or richly Inlaid.

Group 33.

Productions in Marble, Bronze, Cast Iron and Wrought Iron.

See p. 434.

2237 Eugen Berner * Bronze vase covered with patina of bronze alloy.

2238 Walter Elkan * Metal work in japanese metal alloys, covered with patina; vases and ash trays.

2239 Paul Haustein * Liquer stand, silvered copper, tea service and tray wrought in copper.

2240 Hermann Hirzel * Vase of Japanese metal alloys.

2241 Ludwig Kindler * Writing set, in bronze.

2242 Elena Luksch * Table clock "Dachauerin," in bronze.

2243 Richard Riemerschmid * Candlestick, brass.

2244 Else Sapatka * Tray, wrought copper.

2245 Theodor Schmuz-Baudiss * Vases in bronze, inlaid with Japanese metal alloys.

2. Single Groups.

Group 28.

Stationery.

(Palace of Liberal Arts).

2248 **G. Bormann Nachfolg., Inhaber Max Otto, Kgl. Hoflieferant** * Berlin C. 2. * Manufact. of finest indelible Artists colours, Indian Ink and Inks Oil-colours, Water-colours, Pastel Colours, General Staff Colours and Plan Colours. Coloured Chalks Drawing, Copying and tracing paper. Awarded Prize Medals at the Exhibitions at Wien 1873, Berlin 1878 and 1879, Melbourne 1888, Chicago 1893, Berlin 1896, Awarded the Prussian State Medal 1896. The factory (originally J. Steiner) has been in existence about 100 years.

2249 **A.W. Faber** * Stein bei Nürnberg (Bayern) * Pencil manufactory. The manufactory has been in existence since 1761. All kinds of pencils and coloured pencils for Artists, Architects, Engineers, Offices, Schools, &c. All kinds of holders for artists' pencils and crayons. Rulers, Squares, Drawing-Scales, Calculating-Scales, T Squares, Inks, Artists' Colours, Indian Ink in cakes and liquid. India-rubber for artists, plain and fitted in wood, India-rubber bands. The firm employs 1,000 Workmen. Branches in Geroldsgrün, Berlin, Noisy-le-Sec, London, New York, Newark. Steam and water power, together 300 H.P.; 20 Gold medals and First Prizes. Grand Prix, highest award, at the Paris Exhibition 1900. Registered Trade marks: A. W. FABER and A. W. F.

2250 **Ferd. Emil Jagenberg** * Düsseldorf a. Rh. * Pasting machines, machines for making Card-board Boxes, Machinery for Book-binding and Paper-Work. See grp. 24 p. 427.

2251 **Alex Junkers, Farbentechniker, Fabrik wetterfester Normal-Mineralfarben für Malerei und Anstrich** * Berlin SW. 13 * Colours for painting Façades and Churches on lime and cement plaster, washable, proof against weather and light. See Paintings grp. 37 p. 445 Artists Guhr & Männchen. See grp. 23 p. 426.

2252 **J. Landauer** * Braunschweig * Tracing linen and materials for Bookbinders. Established 1852. Silver medal Paris 1900 (first time of Exhibiting). Branches: New York (Alfred Stepan, 76 & 78, Park Place), Berlin, Brüssel, Budapest, Hamburg, London, Paris, Wien. Tracing linen.

Meyer & Kersting, Inhaber Heinrich Kersting * Karlsruhe (Baden) * Apparatus and Platina-Irid Burner for Pyrography. 2253

2254 **C. W. Motz & Co.** * Berlin W.-Schöneberg * Speciality: Drawing Pins. Output 500,000 Pins per Week. Inventor of the steel pin in one piece. Export to all countries.

2255 **Bernhard Münz, Galanterie- und Schreibwarenmanufaktur** * Nürnberg * Speciality: Original and Unique writing Requisites. Own Inventions.

2256 **Sächsische Reisszeugfabrik F. C. Hertel & Co.** * Neu-Coswig-Dresden * Mathematical Instruments in all systems.

2256a **Paul Süss, A. G.** * Mügeln-Dresden * Congratulating and post cards.

See advertisements p. 27.

Group 29.

Cutlery.

(Palace of Liberal Arts.)

2257 **Friedrich Dick** * Esslingen a. Neckar * Knives, Butcher's Steels, Choppers, Carving and Table Knives and Forks. (Machinery). See grps. 30 and 65 p. 438 and 471.

See advertisements p. 27.

2258 **C. Friedr. Ern** * Wald (Rheinland) * Manufactory of hollow-ground Razors. Established 1873. First and most important of its kind. Patent forging and grinding Process. 1904 about 500 Workmen. Annual Production about 170,000 dozen. Export to the United States about 50,000 dozen. Silber State medal, Gold medal at the Düsseldorf Exhibition 1902.

2259 **J. A. Henckels-Zwillingswerk** * Solingen

Trade Mark: "The Twins"  Registered 13. June 1731

Purveyor to the Royal Prussian and Grecian Courts, Steel-ware Manufacturer to the Imperial and Royal Austrian Court. Number of Workmen 2,300. Export to all countries. Steel-ware of all kinds of best quality: Knives and Forks. Knives for all purposes, Pocket-knives, Gardening Knives, Couteaux de chasse, Razors and Shaving Apparatuses, Scissors for all purposes, Corkscrews, Instruments for manicure, &c. The Firm has its own Cast steel Works. High Distinctions awarded: Berlin 1844, Leipzig 1850, London 1851, Düsseldorf 1852, New York 1853, Paris 1855 (Médaille d'honneur), Wien 1873, Düsseldorf 1880, Antwerpen 1885, Berlin 1896 (Gold

State Medal), Chicago 1893, Paris 1900 (Grand Prix), Düsseldorf 1902 (Gold Medal). Branches: Berlin, Dresden, Frankfurt a. M., Hamburg, Cöln and Wien. Sole Representative for the United States: Graef & Schmidt, New York, 107, Chambers Street.

Group 30.

Silversmiths' and Goldsmiths' Ware.

2260 **Exhibit of the Edelmetallindustrie zu Hanau** * See p. 400 and 440.

2261 **Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen"** * Berlin * See p. 399 to 401, 440, 441, 456, 457, 461 and 467.

2262 **Exhibit of the "Vereinigte Werkstätten, G. m. b. H."** * München * See p. 400, 401, 440, 441, 448, 459 and 465.

2263 **A. Berger, Jeweller** * Dresden * Silver Inkstand with Penholder. See grp. 37 p. 449.

2264 **Berliner Electro-Plated-Waren-Fabrik, G.m.b.H.** * Berlin, Ritterstr. 90 * Electro-plated articles for the Table. Speciality: Crystal mounts, Novelties, Hotel Fittings. Representative: Brüder Rachmann of Haida (Bohemia).

2265 **Prof. E. F. Berner** * Stuttgart * Enamelled casket. See grp. 37 p. 455.

2266 **Bertrand, Jeweller** * Dresden * Hammer and bell for the City Council, copper and silver with tarsia work, designed by Margar. Junge. See grp. 37 p. 449.

2267 **C. A. Beumers** * Düsseldorf a. Rhein * Ateliers for ecclesiastical and secular Objects of art. Established 1850. State medal and Gold medal Düsseldorf 1902, Highest award for Industrial art. The articles were the only ones of the branch from Rhineland and Westphalia that were admitted into the National Art Exhibition at Düsseldorf 1902. Received important commissions for the Royal Museums for Art and Industry in Berlin and Stuttgart, was entrusted with work for the Germanic Museum, Harvard University, Cambridge, which, however, was not executed by the galvano-plastic method but by hand. Speciality: Reproduction and restoration in enamel, gold, silver, and bronze, of objects of artistic and historical interest. Work of this kind executed by the firm are important objects in the collection of Prince Hohenzollern, the treasures of the Siegburg parish church, 11th to 15th century enamels, the treasures of the church at Hochelten, the shrines of the St. Vitor, Xanten and many others. Number of workmen: 25, motors developing 4 H.P. See grps. 32 and 37 p. 441 and 448.

2268 **Emil Binder, Bijouterlefabrik** * Pforzheim * Established 1888 * Speciality: Enamel jewellery, souvenirs, silver goods. Prize medal Chicago. Several Patterns and Patents. See grp. 31 p. 440. See advertisements p. 21.

2269 **Wilh. Birmelin (Representative Gebr. Schiff)** * Pforzheim * Enamel jewellery in modern style from designs by German artists. See grp. 31 p. 440.

2270 **B. Bohrmann Nachfolger** * Frankfurt a. M. * Manufactory of electro-plated table-silver. Especially for hotel and restaurant use. Purveyors of all the electro-plated table-silver used by the "Deutsches Weinrestaurant Kons & Pfennings." See p. 362.

2271 **P. Bruckmann & Söhne** * Heilbronn a. N. * Silver, marble, and bronze fountains: allegorical representation of German music. Designed by Prof. Otto Rieth. Silver objects. See grp. 37 p. 454.

2272 **Friedr. Dick** * Esslingen a. N. * Tools for Goldsmiths and silversmiths. (Machinery Hall.) See grps. 29 and 65 p. 437 and 471. See advertisements p. 27.

2273 **Leopold Eberth** * München * Silver, Precious metal and stones from designs by Max Pfeiffer, München. See grp. 31 p. 440.

2274 **Emmy v. Egidy** * München * Silver bowl. See grps. 14 and 31 p. 401 and 440.

2275 **Eisenhütten- und Emaillierwerk Neusalz a. O.** * (Principal W. von Krause, Berlin.) Established 1827. 1,400 workmen. Articles exhibited: Artistic enamelling on chased copper, partly original work, partly copied from old masters. Other productions of the Works: Cast-Iron goods of all kinds, builder's and machine castings. Household utensils. Cast enamel goods, baths, &c. Pumps for household and industrial purposes. Stable Fittings. Lavatories. Prize medals awarded at Paris, London, Berlin, Breslau, Frankfurt a.O., Porto Alegre, &c. Represented by Brüder Rachmann from Haida. See advertisements p. 16.

2276 **Ferd. Hardt, Lehrer an der Kunstgewerbeschule** * Pforzheim * Art enamel paintings and miniatures.

2277 **Gabriel Hermeling** * Cöln a. Rh. * Court Goldsmith and Enameller. Holder of the Large gold State medal. Table-silver, decorative articles, church requisites, enamel work. Objects of art.

2278 **E. Kayser** * Cöln a. Rh. * Court Purveyor für die Firma J. P. Kayser Sohn * Crefeld * Articles for Use and Ornament of Kayserzinn. Gold medals: Paris 1900, Düsseldorf 1902, Turin 1902.
See advertisements p. 3.

2279 **Mau, Court Jeweller** * Dresden * Inkstand and Pen-holder for the Dresden City Council. See grp. 37 p. 449.

2280 **Milde, Jeweller** * Dresden * Hammer and Bell for the Dresden City Council, in silver and Ivory, designed and modelled by Gertrud Kleinhempel. See grp. 37 p. 449.

2281 **Prof. Friedrich von Miller** * München * Jonas Drinking-cup, State Goblet, small silver figures. See grp. 37 p. 447.

2282 **Orivit, Aktiengesellschaft für kunstgewerbliche Metallwarenfabrikation vorm. Rhein. Bronzegiesserei Ferd. Hub. Schmitz** * Cöln a. Rh. * Branches: Berlin, Hamburg, Paris, Wien. Articles for Use and Ornamentation in Sterling silver, Silver-plated Hard-metal (New Silver), Orivit metal. Paris 1900 Gold medal, Düsseldorf 1902 Gold medal, Silver State medal. See grp. 65 p. 471.

2283 **Pirner & Franz, Erzgiesserei** * Dresden-A. * Established 1881. Monuments, Small artistic articles in Silver and Bronze. Ballot-box in Bronze for the Dresden City Council. See grp. 37 p. 449.

2284 **Metallwarenfabrik für Kleinkunst Walter Scherf & Co.** * Nürnberg * Brands "ISIS" and "OSIRIS." Articles for Use and Ornament in "Osiris"-metal in combination with fine Crystal, Majolica, &c. artistically executed, especially: Electric Lamps, Candlesticks, Vases, Clocks, Caskets, Mirrors, Jardinières, Writing necessaries, Table-silver, &c. Established 1899, about 100 Persons employed. Awarded the Gold medal of the King Ludwig Preis Stiftung "for the very tastefully and from a technical point of view, excellently executed artistic and useful metal work." Large Gold medal of the "International Exhibition of Art and Industry, St. Petersburg 1903/04." See grp. 33 p. 443.

2285 **C. C. Schirm, Atelier für Emaille** * Grunewald b. Berlin * Inlaid Enamel. See grp. 37 p. 455.

2286 **Prof. Adolf Schmid** * Pforzheim * Silver Inkstand. See grps. 11 and 37 p. 400 and 446.

2287 **Johannes Seller, Sculptor** * München, Karlstr. 45 * Wall-fountain, Dressing-glass, Card-Tray in Bronze.

Steinicken & Lohr * München * Metal Articles of all kinds from Designs by O. Lohr, A. Hohlrein and Ignatz Taeschner in München. See grp. 37 p. 447. 2288

2289 **J. H. Werner, Court Jeweller to His Majesty the Emperor** * Berlin W. 8, Friedrichstrasse 173 * Gold and Silver Wares. See p. 361 and grp. 31 p. 440.

2290 **W. H. Wilkens u. Söhne, Silberwarenfabrik** * Hemelingen * Table silver. See grp. 37 p. 455.

2291 **Carl Winterhalter, Royal goldsmith** * München * Decorative Articles and Drinkings-cup in Silver. See grp. 37 p. 447.

2292 **August Witte, Päpstlicher Hofgoldschmied und Stiftsgoldschmied** * Aachen * Ecclesiastical and secular Objects of Art and Enamels.

2293 **Eduard Wollenweber, Hofsilberarbeiter** * München * Decorative Articles in Silver. See grp. 37 p. 447.

Galvanic Reproductions of German Silver Work.

(Collective Exhibit.)

After His Majesty the Kaiser had presented to the Germanic Museum of Harvard University, Cambridge, Mass., a collection of plaster casts of German Sculptures and Architectural Work, a number of Germans resolved to supplement the Imperial gift by a similar, though more modest endowment. It was decided to have galvano-plastic copies made of the finest silver-work from the best period of German Civic art. The nucleus for such a collection had been previously created by industrial Art Institutes in Berlin, Vienna, London and Paris. The best specimens were selected from these under the direction of the Royal Museum for Art and Industry in Berlin, and a further series of new reproductions made. The valuable originals were most willingly lent for the purpose by His Majesty the Kaiser, by other German Princes, by Towns, Guilds, and Museums.

This collection of 55 articles furnishes an excellent representation of German Goldsmiths' art from the 15th to the 18th century. The most celebrated art centres in North and South, especially Nürnberg and Augsburg, are represented, as are also the best masters, with Wenzel Jamnitzer at the head. The goblets, drinking-cups, and bowls reflect the German domesticity and

Sociability. The originals were in most cases presented by the citizens to the municipal Treasury or placed by them in the Guild-Halls of the old towns; later specimens show the magnificence of the Princely Castles with their wonderful plate. Some specimens of older ecclesiastical utensils are added.

The reproductions, which have been absolutely faithfully made by dint of arduous labour were executed by the following German firms.

2294 C.A. Beumers, Goldsmith * Düsseldorf.

2295 Galvanoplastische Kunstanstalt * Geislingen-Steige. Grösste deutsche Anstalt für galvanoplastische Erzeugnisse.

2296 Theodor Heiden, Bavarian court-goldsmith * München.

2297 Sy & Wagner, Cour-goldsmiths to His Majesty the Emperor * Berlin, Werderstrasse 7.

2298 D. Vollgold & Sohn, Court-goldsmiths te His Majesty the Emperor * Berlin, Unter den Linden 34 * Established 1810.

Group 31.

Jewelery.

2299 Exhibit of the Bernsteinindustrie. * See p. 401, 441, 444 and 460.

2300 Exhibit of the Edelmetallindustrie zu Hanau * See p. 400 and 438.

2301 Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen" * Berlin * See p. 399–401, 438, 441, 456, 457, 461 and 467.

2302 Exhibit of the "Vereinigte Werkstätten für Kunst im Handwerk, G. m. b. H." * München * See p. 400, 401, 438, 441, 448, 459 and 465.

2303 Emil Binder, Bijouteriefabrik * Pforzheim * Souvenirs with enamel decoration; modern trimming in silver. See grp. 30 p. 438. Advertisement p. 21.

2304 Wilh. Birmelin, Bijouteriefabrik (Vertreter Gebr. Schiff) * Pforzheim * Enamel jewellery in modern style from designs by German artists. See grp. 30 p. 438.

2305 W. Lucas von Cranach * Berlin * Kurfürstenstrasse 126 * A collection of jewellery exhibited by Gebr. Friedländer, Court Jewellers, Berlin.

2306 Fred. Dunn & Co. * München * Necklaces, Brooches, Pendants. See grps. 33 and 37 p. 442 and 447.

2307 Leopold Eberth * München * Jewellery in gold and silver, precious metals and stones, from designs by Max Pfeiffer. See grp. 30 p. 438.

2308 Emmy von Egidy * München * Jewellery. See grp. 14 and 30 p. 401 and 438.

2309 Theodor Fahrner * Pforzheim * Manufactory of gold and silver ware. Speciality: artistic jewellery from original designs by leading artists. See grp. 37 p. 446.

2310 Louis Fiessler & Cie. * Pforzheim * Manufactory of gold wares and chains, wholesale. Prize medals awarded: Paris, Antwerp, Chicago. Patents and trademarks. Trade at home and abroad.

2311 Gebr. Friedländer, Hofjuwellere Seiner Majestät des Deutschen Kaisers * Berlin W., Unter den Linden 28, * The firm has been in existence since 1829. Workshops for jewellery and silver-ware. About 200 Employees. Caskets and jewellery for presentation with portraits and initials of His Majesty the German Emperor. Collection of German Orders. Modern jewellery. See German State Building p. 360.

2312 Prof. G. Kleemann * Kunstgewerbeschule, Pforzheim * Jewellery in precious metal, executed by Lauer und Wiedmann, Hans Söllner u. F. Zerenner. See grp. 37 p. 446.

2313 Siegmar Lewy * Berlin S., Ritterstr. 24 * Silver-trinkets, modern jewellery.

2314 G. Merk, Kgl. Bayer. Court-jeweller, Proprietor Paul Merk * München * Jewellery in gold and silver with brilliants, pearls and precious stones.
See advertisements p. 12.

2315 Max Pfeiffer, Artist and Sculptor * München * Jewellery in precious metal with stones. (Executed by Leopold Eberth, München). See grp. 37 p. 447.

2316 Joseph E. Schneckendorf, Atelier für kunstgewerblichen Schmuck * München * Jewellery in oxydised silver and silver gilt. See grp. 37 p. 447.

2317 Eduard Schöpflich, Kunstgewerbliche Werkstätte für modernen Schmuck * München * Jewellery in gold and silver.

2318 Friedrich Speidel * Pforzheim * Established 1868. Speciality: plated chains and chain Bracelets of all kinds.

2319 J. H. Werner, Court-jeweller to His Majesty the Emperor * Berlin, Friedrichstrasse 173 * Jewellery, Manufactory of Orders. See German State Building p. 361 and grp. 30 p. 439.

Group 32.

Watch and Clock making.

2320 Exhibit of the Bernsteinindustrie. See p. 401, 440, 444 and 460.

2321 Exhibit of the Vereinigte Werkstätten für Kunst im Handwerk, G. m. b. H. * München * See p. 400, 401, 438, 440, 448, 459 and 465.

2322 Arndt & Marcus * Berlin, Elisabethufer 29 * Clock inlaid with metal and amber. See grps. 33 and 37 p. 442 and 454.

2323 Math. Bäuerle, Uhrenfabrik * St. Georgen, Bad. Schwarzwald * Founded 1863. Shelf and wall clocks of every kind in the best workmanship only, from the simplest to the most complicated. Speciality: all kinds of work for the English market, sixteen varieties of standing clocks with case, and eight of bracket chimes clocks, &c. Over 100 hands at present. Exports to every country. Several awards, last being Paris 1900 gold medal. (Palace of Liberal Arts.)

2324 C. A. Beumers, Goldsmith * Düsseldorf * Clock, dial and panels. See grps. 30 and 37 p. 438 and 448.

2325 Eduard Frei, Kunsttischlerei * Darmstadt * Timepiece with hammered metal dial from designs by Prof. J. M. Olbrich. See grps. 33, 37, 38 and 43 p. 442, 453, 458 and 462.

2326 Theodor Holländer & Co., Kunstgewerbl. Werkstätten * München * Metal clocks. See grp. 33 p. 442.

2327 Georg Karp, Hofuhrmacher * Darmstadt * Timepiece. See grp. 37 p. 452 and 453.

2328 Hugo Kaufmann * München * Decorated clock "Die Zeit." See grps. 11 and 37 p. 400, 436 and 447.

2329 Geo Kühl & Co. * Chicago, 178 E Randolph Street * Importer of cuckoo clocks, clocks and wood carvings from the Black Forest. (Palace of Liberal Arts.)

2330 A. Lange & Söhne, Deutsche Uhrenfabrikation * Glashütte, Sachsen * Founded 1845. Twenty-eight first prizes. Time keeping watches, ships chronometers, measuring instruments and casings.

2331 Friedr. Mauthe, G. m. b. H., Uhrenfabriken * Schwenningen a. N., Schwarzwald * House clock in modern style, solid work, striking four tones at the quarters. Four small standing clocks, one day and eight days, 1,200 workmen. Every kind of German or American clock system. Branches at Bregenz (Austria); Paris, 60, Rue de Bondy; Allensbach (Baden). Medal: Chicago 1893. Gold medals: Stuttgart 1881 and 1896, Paris 1900, and Athens 1903. Silver medal: London 1890. See grp. 37 p. 455.

2332 Gebr. Meister * Berlin, Brandenburgstrasse 42 * Large clock with regulating connections with independant clocks of same or different construction, size and quality. Station clock regulated electrically from the same. (Transport Building.)

2333 C. Prächtel, Court master joiner * Berlin, Krausenstr. 31/32 * Standing clocks. See grps. 37–39 and 42–44 p. 449, 454, 455, 458, 460, 462 and 463.

2334 C. F. Rochlitz * Berlin, Brandenburgstrasse 55 * Works of the tower clock of the German State Building, church clocks, school clocks, railway, factory, public building clocks. Signals for marine and fire brigade. See p. 372.

2335 Prof. O. Rohloff, Metal chaser * Berlin * Fancy clock. See p. 361 and grp. 33 p. 443.

2336 Ludwig Schäfer, Möbelfabrik * Mainz * Timepiece with facetted crystal glasses, repoussé dial and tarsias. See grps. 37–39, 41, 43 and 44 p. 452, 453, 459, 460 and 463.

Group 33.

Productions in Marble, Bronze, Cast and Wrought Iron. See p. 434.

2337 Exhibit of the "Verein d. Künstlerinnen u. Kunstfreundinnen" * Berlin * See p. 399–401, 438, 440, 456, 457, 461 and 467.

2338 Exhibit of the Ver. Werkstätten für Kunst im Handwerk, G. m. b. H. * München * See p. 400, 401, 438, 440, 448, 459 and 465.

2339 Franz X. Abt * Mindelheim (Bayern) * Kupfer-Kunsttreibanstalt. Diploma Lyon 1901. Gold medal and cross of honour. Wall placque of repoussé copper. Hammered work in one piece.

2340 Aktiengesellschaft vorm. H. Gladenbeck & Sohn, Bildgiesserei * Berlin S., Ritterstrasse 24 * Bronze figures. Artistic objects of use. Monument casting for memorials and architecture. See German State Building p. 359.

2341 Aktiengesellschaft vorm. H. Gladenbeck & Sohn, Abteilung E. Lewy-Söhne * Berlin S., Ritterstr. 24 * Fancy articles, of metal combined with glass, porcelain, onyx, stone, &c. Representatives Rachmann Bros. of Haida.

2342 Aktiengesellschaft Lauchhammer * Lauchhammer (Prov. Sachsen) * Bronze cast of a model for a "Steuben" monument, and of a fountain figure "Evening." See German State Building p. 362.

2343 **Gebrüder Armbrüster, Decorative smith** * Frankfurt a. M. * Eagle in wrought bronze, and repoussé metal work.

2344 **Arndt & Marcus** * Berlin, Elisabethufer 29 * Figures, clocks, accessories for writing desks and smokers' tables, electric light fittings, flower stands, mounted glass and faience, &c., in solid bronze. See grps. 32 and 37 p. 441 and 454.

2345 **Louis Busch, Bronzewarenfabrik** * Mainz * Lustres * See grps. 37 and 41 p. 452 and 460.

2346 **Fridolin Dietsche** * Karlsruhe * Two wall fountain in wrought copper and marble. See grps. 11 and 37 p. 400, 445, 447 and 453.

2347 **Fred. Dunn & Co.** * München * Bronzes: inkstands, candlesticks. See grps. 31 and 37 p. 440 and 447.

2348 **Nelly von Eichler** * Eurasburg bei München * Bronze candlestick with two figures. See grp. 11 p. 400.

2349 **Walter Elkan** * Berlin, Dessauer Strasse 6 * Articles in wrought copper covered with red patina, in metal setting. Speciality: metal colouring. See grps. 33 and 37 p. 436 and 450.

2350 **Erzgiesserei "Renaissance," G. m. b. H.** * München * Bronze. See grp. 37 p. 448.

2351 **Ch. Fambach and Alb. Hagner, Werkstätte für kunstgewerbliche Arbeiten** * Mainz * Ornamental vases. See grp. 37 p. 452.

2352 **Eduard Frei, Kunsttischlerei** * Darmstadt * Smoking table with metal top. See grps. 32, 37, 38 and 43 p. 441, 453, 458 and 462.

2353 **Oskar Fritz, Kunstschlosserei** * Berlin W., Karlsbad 15 * Brass work. See grp. 37 p. 449.

2354 **H. Frost & Söhne** * Berlin * Fabrik für stilgerechte Beleuchtungskörper * See German State Building p. 359, 361 and 362.

2355 **Fürstl. Stolbergsches Hüttenamt** * Ilsenburg * Art objects in cast iron, from designs by Albin Müller, architect, Magdeburg. See grp. 37 p. 450.

2356 **Prof. A. Gaul, Sculptor** * Wilmersdorf bei Berlin * Design of bronze eagle for Armbrüster Bros. of Frankfurt a. M.

2357 **Georg Gehlert, Kupferschmiede and Verzinnerei** * Kiel, Papenkamp 11 * Wrought copper work.

2358 **Deutsche Zentralstelle für klassische Skulpturen, Statuen, Büsten, Reliefs der Antike, des Mittelalters und der Neuzeit, Kunstanstalt August Gerber** * Cöln a. Rh. * Original casts and reductions, white or covered with patina according to the original to resemble old marble, bronze, ivory or wood carving. Largest business in Germany. Prussian silver State medal since 1883. Whole museums furnished, archæologically or artistically. Collections for universities, colleges, academies, drawing schools, &c. Best source for art bargains and amateurs. (Palace of Liberal Arts and German State Building.) See p. 360 and 361.

2359 **Gladenbecks Bronzegiesserei, Inhaber Hermann, Alfred und Walter Gladenbeck** * Friedrichshagen bei Berlin * Stands for the flagstaffs on the German State Building. See p. 362.

2360 **J. Goldschmidt, Metall- und Zinnwarenfabrik** * Nürnberg * Metal work for use or ornamentation, wrought copper. (Liberal Arts Palace.)

2361 **E. van Hauten Sohn** * Bonn a. Rh. * Metallwarenfabrik u. Glaswarenfabrik, Works for metal and glass articles for use or ornament, in metal only, in metal mounted glass, in coloured enamelled glass with covering and translucent enamels, faience mounted in metal, vases, flower stands, pots, table services, trays, bowls, bread baskets, cake tins, plates, jugs, cans, wine glasses, tumblers, beer jugs. The models, shapes, castings, and work, the glass decorations and the treatment in the furnace are all made in the factory. Founded 1880. Exports to every part of the world. Agencies with samples on view in Berlin, Paris, London, Zürich, Vienna, Bonn, and at the Leipzig "Messe." Awards for high class work Amsterdam, and Brussels, also silver medal, state medal, and Royal Prussian Court Diploma from Düsseldorf 1904. Trade mark for metal goods. See grp. 47 p. 465.

2362 **Herm. Held Nachfolger** * Magdeburg * Copper wall fountains, furniture mounts. See grp. 37 p. 450.

2362a **R. Hermann, Art locksmith** * Berlin * Wrought iron railing to the hind façade of the German State Building. See p. 362.

2363 **Victor Hillmer, Kunstschlosserei** * Berlin, Belle-Alliance-Str. 95 * Mountings and other met. work. Bronze. See grp. 37 p. 456.

2364 **Theodor Holländer & Co.** * München * Wrought copper and brass. Articles for use and ornament, metal clocks. See grp. 32 p. 441.

2365 **Eduard Hueck** * Lüdenscheid * Artistic metal goods in pure tin and bronze-copper. Kitchen and Table forks and spoons in nickle, German silver and aluminium. See grp. 37 p. 450 and 453.

2366 **Martin Jacobi, Fabrik moderner Beleuchtungskörper** * Berlin W., Luitpoldstr. 17 * Light fittings. See grp. 37 p. 455.

2367 **R. Kallenberg & Co.** * München * Wrought iron and brass work from designs by Munich artists. Articles of use and ornament. Gas and electric light fittings. See grp. 37 p. 448.

2368 **Reinhold Kirsch, Court decorative smith** * München * Antique gothic clock in iron. Specialities: lustres, lanterns, chimney pieces, doors, gates, &c.

2369 **G. Knodt, Metallwarenfabrik** * Frankfurt a. M. * Figures and groups in copper and bronze from models of any size. Two groups for fountains, model by O. Stichling. Teuton, warriors, model by Rud. Begas. Eagle, model by Joh. Böse. Candelabra from design by Br. Schmitz. See German State Building p. 362.

2370 **Koenig & Lengsfeld** * Köln-Lindenthal * Studios for marble sculpture, art terracotta and galvanised bronze. Models by leading artists. Speciality: figures for electric lighting, vases, groups, &c., for room decoration, tomb-stones and monuments. Branches and agencies in Paris, Cöln, Berlin, Hamburg, Leipzig, St. Petersburg. (Palace of Liberal Arts.)

2371 **Friedrich Lang, Kunstschlosserei** * Karlsruhe * Fittings for gas and electric light, fenders. See grp. 37 p. 446.

2372 **August Laubisch** * Magdeburg * Crown from design by P. Bernadelli, wrought iron with artistic glass work for electric light. See grp. 37 p. 451.

2373 **G. Leander** * Berlin SO. * Bronze and silver with enamel and inlaid amber. See grp. 37 p. 454 and 455.

2374 **Julius Lennhoff** * Berlin SO. * Artistic bronzes. Light fittings, table lamps, ornamental pottery. See German State Building p. 362.

2375 **Siegmar Lewy** * Berlin, Ritterstr. 24 * Articles for use or ornament with galvanoplastic decorations, in glass, porcelain, &c. Represented by Rachmann Bros, of Haida. See grps. 31 and 47 p. 440 and 465.

2376 **L. Lichtinger, Atelier für kunstgewerbliche Metallarbeiten** * München * Articles of use and ornament in tin. See grp. 37 p. 447.

2377 **Gustav Lind Nachf., Metallbildhauerei** * Berlin, Genthiner Str. 3 * In the "Court of honour:" two bronze flower stands filled out with wrought figures, two large lions heads in bronze. Hygienic bath: Pillars and gates in bronze. The firm delivers the following high class goods: wrought copper and bronze figures, chimney pieces, façades, reliefs, and wrought and chisled work in every kind of metal. See grp. 37 p. 457.

2378 **S. A. Loevy** * Berlin, Gartenstr. 96 * Hood in metal for open fire-place and silver plated furniture mountings, wrought tea-tray. See grp. 37 p. 454.

2379 **Jul. Müller-Salem, Teacher at the Art Industrial School** * Pforzheim * Metal work. See grps. 14 and 37 p. 402 and 446.

2380 **Reiss, Neumann & Gansereit** * Berlin, Ritterstr. 49 * Articles for lighting. See grp. 37 p. 451.

2381 **Ph. Reitmayer, Chaser** * Mainz * Wrought metal work. Chimney piece fittings. See grp. 37 p. 452 and 453.

2382 **O. Rohloff, Professor at the Royal Industrial Art Museum** * Berlin * Gold plated clock, property of His Majesty Emperor Wilhelm II.; chimney piece fittings, and fittings for writing desks. See German State Building p. 361 and grp. 32 p. 441.

2383 **Otto Scheer, Metal chaser** * Berlin, Königgrätzer Str. 58 * Industrial art work, for the most part in metal. See grp. 37 p. 451.

2384 **Walter Scherf & Co., Metallwarenfabrik für Kleinkunst** * Nürnberg * Articles for use and ornament of "Osiris" metal and genuine silver, alone or with crystal and majolica. See grp. 30 p. 439.

2385 **Jos. Schmeidl, Workshops for industrial art work in every kind of metal** * München * Industrial art work, articles in tin, and ornaments.

2386 **Heinrich Schmiedt** * München * Wrought work. Articles for use and ornament in tin and copper.

2387 **A. Schmits** * Düsseldorf * Workshops for wrought metal work. Wrought mountings, panels, light fittings. See grp. 37 p. 449.

2388 **Georg Friedr. Schmitt, Kunstgewerbliche Metallwarenfabrik "Orion"** * Nürnberg * Industrial art objects in tin.

2389 **Otto Schultz, Tezettgitterwerk, Kunstschmiede** * Berlin SW., Hallesches Ufer 36 * Founded 1886. The works are fitted out with the best German and American machinery. Electric, compressed air, and gas power-engines. Mechanical stamping, pressing, and hammering machines. Special productions: artistic forge work in iron and bronze. Wholesale manufacture of

"Tezett" railings and balustrades, protected by patent in Germany as well as in America and other foreign countries. The firm supplied 350,000 kilograms of "Tezett" railings for the electric elevated railway in Berlin. Home and foreign catalogues gratis. In the "Court of honour," artistically wrought German eagle, 8×12 meters.

See advertisements p. 1

2390 O. Stichling, Sculptor * Berlin, Kleiststrasse 3 * Design for the fountain group in wrought copper by G. Knodt, Frankfurt a. M.

2391 Paul Stotz, kunstgewerbliche Werkstätte, G. m. b. H. * Stuttgart * Fittings for gas and electric light. Art bronzes. See grp. 37 p. 456.

2392 Prof. Kuno von Uechtritz * Berlin W., Pfalzburger Str. 3 * Model of the "Steuben" monument. Figure for fountain, "Evening." See German State Building, p. 362.

2393 W. Weiss * Karlsruhe * Wrought metal work. See grp. 37 p. 446.

2394 Wilhelm & Lind, Galvanoplastische Anstalt * München * Industrial art work in metal.

2395 J. Winhart & Co. * München * Industrial art work in copper and other metals. Specialities: flower stands, palm tubs, vases, bowls, jugs, tea services, wine coolers.

2396 Fritz Wolber, Professor at the Industrial Art School * Pforzheim * Metal work. See grp. 37 p. 446.

2397 Josef Zimmermann u. Co. * München * Wrought and hammered work, lighting fittings, column casings, and chimney-piece decorations. See grp. 37 p. 447 and 448.

Group 34.

Brushes, fine leather goods, basket work and fancy articles.

2398 Exhibit of the Bernsteinindustrie. See p. 401, 440, 441 and 460.

2399 S. Hirsch * Berlin, Ritterstr. 75 * Belts, clasps, buckles, satchels. (Palace of Liberal Arts.)

2400 Georg Hulbe, Kunstgewerbl. Werkstatt für Lederarbeiten * Hamburg * Fine leather goods. See grps. 14 and 43 p. 401 and 462.

2401 Fr. und E. Seyffarth * Magdeburg * Writing cases and leather goods from designs by Paul Lang. See grp. 37 p. 451.

Group 36.

Toys.

1. Collective Exhibit of the Sonneberg Toy-Industry.

After the designs by Director Prof. Möller, arranged in the industrial school at Sonneberg. Manager: The Chamber of Commerce in Sonneberg.

Julius Bähring (for masks only). 2402
Emil Bauersachs. 2403
Geo Borgfeldt & Co. 2404
Crämer & Héron. 2405
Julius Dorst. 2406
Cuno & Otto Dressel. 2407
Wilhelm Dressel. 2408
E. Escher jun. 2409
A. Fleischmann & Crämer. 2410
Gebrüder Fleischmann. 2411
J. Franz. 2412
Carl Geyer. 2413
Hermann Hachmeister. 2414
Karl Harmus jun. 2415
Robert Hartwig. 2416
Hugo Heubach. 2417
C. Hoffmeister. 2418
Heinrich Horn. 2419
Andreas König. 2420
Richard Leutheuser. 2421
Louis Lindner & Söhne. 2422
Hermann Lützelberger. 2423
J. H. Lützelberger. 2424
A. Luge & Co. 2425
Müller & Froebel. 2426
Wilhelm Pfarr. 2427
Philipp Samhammer & Co. 2428
F. W. Schilling. 2429
G. Schmey, Nachfolger. 2430
Arthur Schoenau. 2431
Georg Spindler jun. (for masks only). 2432
Louis Wolf & Co. 2433
Zeuch & Lausmann. 2434

2. Single Exhibitors.

S. F. Fischer * Oberseiffenbach (Erzgebirge) * Established 1850. Boxes of bricks, laying games, materials 2435

for instruction and employment for Fröbel's Kindergarten. Numerous awards. See p. 388.

2436 Hamburger & Co. * Berlin, Alexandrinenstr. 93/94, Branch in New York: 28–30 W. 4th Ave. * Elegant dolls, dressed or undressed.

2437 F. Ad. Richter & Cie. * Rudolstadt (Thüringen) * "Anchor Blocks" and the "Libellion" Musical Instrument. — "Anchor Blocks" have now for over a quarter of a century been the most popular occupation for children and adults. Their educational value for children is self evident, for they train them to habits of order, cultivate their love of the beautiful and initiate them in the first principles of architecture. "Anchor Blocks" are highly praised by eminent pedagogues and used in Kindergärten and elementary schools not only as toys but also as important educational factors. The Blocks are made mathematically correct and the buildings designed by architects. "Anchor Blocks" have obtained the highest awards in all civilized countries and are known all over the world. The "Libellion" is the only German steel tongued instrument with long music notes and is thus able to reproduce the longest pieces unabridged. The metal transport guards the notes from wear and tear and the method of stamping enables them to stand any climate. The Libellion was the only German steel tongued instrument awarded a prize at the Chicago World's Fair in 1893. It was also awarded in Paris in 1900. The firm F. A. Richter & Cie. employs over 500 hands in Rudolstadt and has branches and works in Nuremberg, Leipsic, Konstein, Olten (Switzerland), Rotterdam, Prague, Vienna, Hietzing, St. Petersburg, New York. See grps. 21 and 38 p. 416 and 459.

2438 Margarete Steiff * Giengenbrenz * Leading German Felt Toy Factory. Stuffed animals and jointed dolls, best kinds with and without wire frame and wheels, of Felt, Velvet, Woollen stuffs, &c. 1,000 samples after Messrs. Paul, Richard and Franz Steiff, Bros. registered designs. Show Rooms in 15 commercial towns in different parts of the world. Export 1900: 20 per cent, 1903: 50 per cent of output. 1888: 4, 1903: 400 hands. Factory rooms 8,200 sq.-metres, glass and steel throughout. Own construction.

Group 37.

Decoration and fixed Furniture of Buildings and Dwellings.

Art decorations and designs in the German Section of the Art and Industry Department: General Manager: Bruno Möhring, Architect * Berlin * The following architects assisted in the work: Philipp Felde, John Martens, Otto Rahlenbeck * Berlin. 2439

Superintendents of decorative painting: Richard Guhr and Albert Maennchen * Berlin. 2440

Artistic arrangements Marie Kirschner, Artist * Berlin. 2441

1. Rooms and furniture.

Ludwig Alter * Darmstadt.

(Room 44b.)

Drawing-room.

Professor Peter Behrens * Düsseldorf * Design of room, furniture and whole outfit. 2442

Ludwig Alter, Hofmöbelfabrik * Darmstadt * Purveyor to the Imp. Russian and Grand Ducal Hessian Court. Firm of world wide renown, leading in modern interior decoration. Fabrication after original designs of the best known artists. Highest awards Darmstadt 1901, Turin 1902. Execution of all wood and carpentering work in fine woods with intarsia. 2443

Hagener Textilfabrik vorm. Gebr. Elbers * Hagen i. W. * Wall hangings. 2443a

Alfred Altherr & W. Ortlieb * Berlin.

(Room 52.)

Dining room.

Alfred Altherr & W. Ortlieb, Architekten * Berlin * Design of room, furniture and entire trimmings. 2444

W. Dittmar (Inh. Otto Lademann), Möbelfabrik * Berlin, Molkenmarkt 6 * Execution of room in oak, stained in two colours. 2445

Exhibit of Baden Art Industry.

Art and commercial manager: Prof. Karl Hoffacker, Karlsruhe.

(Rooms 29 and 30.)

Ante-room and Reception-room of an Art Collector.

Prof. F. Dietsche * Karlsruhe * Wall fountain wrought of copper and gilt. 2446

2447 H. Drinneberg * Karlsruhe * Glass windows. Art stained.

2448 Th. Fahrner, Jeweller * Pforzheim * Ornaments.

2449 Otto Feist, Sculptor * Karlsruhe * Bronze statuettes, bronze bust, inkstand.

2450 A. Gehrig Wwe., Hofmöbelfabrik * Karlsruhe * Panelling and furniture.

2451 Prof. A. Groh, Artist * Karlsruhe * Wall pictures.

2452 Grossherzogliche Majolikamanufaktur * Karlsruhe * Flag stone pictures after cartoons by Prof. Thoma, majolicas after designs by Mr. Süs, Artist.

2453 Prof. Georg Kleemann, Teacher at the Art Industry School * Pforzheim * Ornaments.

2454 Prof. C. Kornhas, Teacher at the Art Industry School * Karlsruhe * Fire places of glazed clay. Faience.

2455 Kunststickereischule des badischen Frauenvereins * Karlsruhe * Carpet for floor, designed by Prof. Gagel, Carpet for wall, designed by Prof. Thoma, needle work cushion, curtain.

2456 Friedrich Lang, Kunstschlosserei * Karlsruhe * Lighting fittings, fenders.

2457 Robert Macco * Heidelberg * Intarsia factory. Interior decorations, marqueterie for furniture, pianos, panelling, &c., panelling and furniture, small boxes and clocks, inlaid with wood.

2458 Prof. Rudolf Mayer, Chaser, Teacher at the Art Industry School * Karlsruhe * Plaquettes. Medal minting by B. H. Mayer, Pforzheim.

2459 Jul. Müller-Salem, Teacher at the Art Industry School * Pforzheim * Ornaments, casket wrought in iron.

2460 Offenburger Glasmosaikwerke G. m. b. H. * Offenburg * Glass mosaic fillings, mosaic wall panelling.

2461 Prof. Ad. Schmid, Ziseleur, Teacher at the Art Industry School * Pforzheim * Plaquettes, inkstand, ornaments.

2462 Eduard Scholl Nachfolger, Court bookbinder * Karlsruhe und Durlach * Bindings in leather mosaic and hand gilt.

2463 W. Weiss, Coppersmith * Karlsruhe * Mantlepiece.

2464 Fritz Wolber, Professor at the Art Industry School * Pforzheim * Bronze relief.

Prof. H. Billing * Karlsruhe.

(Room 39.)

Music Hall.

Prof. Hermann Billing * Karlsruhe * Design of the room, furniture and entire fittings. 2465

Hermann Binz, Sculptor * Karlsruhe * Bronze statuette: Girl praying. 2466

Hans Drinneberg, Glass painter * Karlsruhe * Glass window, art stained, designed by Walter, Artist. 2467

Prof. A. Groh, Artist * Karlsruhe * Decorative painting. 2468

Rudolf Ibach Sohn, Court purveyor * Barmen * Grand piano with rich case. 2469

Friedrich Lang, Art smith * Karlsruhe * Forged lamps and upright clock. 2470

Erna Lundbeck * Karlsruhe * Silk sofa cushion, linen cover lithography. 2471

Linoleumfabrik Maximiliansau a. Rh. * Floor coverings. 2472

J. L. Peter, Hofmöbelfabrik * Mannheim * Panelling of the room, furniture. 2473

M. Welte & Söhne, Orgel- u. Orchestrionfabrik * Freiburg i. Br. * Orchestrion and organ case. 2474

Prof. Max Läuger * Karlsruhe.

(Room 20.)

Sitting Room.

Prof. Max Läuger * Karlsruhe * Studios for interior decoration. Design of the room, furniture and entire outfit. See further exhibits by Prof. Läuger in the Ceramic Department and Model City. 2475

Adolf Dietler, Hofmöbelfabrik * Freiburg i. B. * Panelling of walls and furniture. 2476

Prof. L. Dill * Karlsruhe * Wall paintings. 2477

Karlsruher Marmor-, Granit- und Syenitwerke Rupp & Moeller * Karlsruhe * Marble fountain. 2478

Emma Läuger * Lörrach i. B. * Manufacture of tapestry and embroidered cushions. 2479

Tonwerke Kandern * Kandern * Flag stone walls, Faience fire places and pottery. 2480

W. Weiss, Coppersmith * Karlsruhe Wrought fire places, lamps furniture mounts. 2481

(Room 19.)

Ante-room.

2482 Prof. F. Dietsche * Karlsruhe * Wall-fountain in marble.

2483 H. Drinneberg * Karlsruhe * Glass-window, art-stained.

2484 F. Gerstenhauer, Joiner * Karlsruhe * Garden-benches.

2485 Grossherzogliche Majolikamanufaktur * Karlsruhe * 2 Wall-pictures near the passages.

2486 Max Läuger * Karlsruhe * Artist and architect, Professor at the Technical High-School * Art-potteries, fountains, &c.

2487 E. Schmidt-Pecht * Konstanz * Faience-vase.

Exhibit of Bavarian Art-Industry.

Art- and Business-Manager:
Prof. Martin Dülfer, München.

Prof. Martin Dülfer * München.

(Room 15 and Front-court 16.)

State-room.

(The decorations are used in the Landrats-hall of Oberfranken at Bayreuth.)

2488 Prof. Martin Dülfer, Architect * München * Design of the room, furniture and artistic fittings.

2489 Eduard Beyrer, Sculptor * München * Bronze: "Madonna."

2490 Boswau & Knauer, G. m. b. H. * Berlin * Stucco-ceiling and Terrazzo-floor.

2491 Sophie Burger-Hartmann, Sculptor * Basel * Various pieces of bronze.

2492 Fritz Christ, Sculptor * München * Pieces of bronze: "Sin," "Pearl" and 2 plaquettes.

2493 Fred Dunn & Co., Atelier und Werkstätten für kunstgewerbliche Metallarbeiten * München * Ornamental bronze, inkstands, candlesticks, &c.

2494 J. A. Eysser, Hofmöbelfabrik * Bayreuth * Outfit of the room and furniture.

2495 Theodor von Gosen, Sculptor * München * Bronze: "Violin-player" and "Bathing."

2496 Prof. Wilhelm Hahn, Sculptor * München * Bronze: "Adam and Eve."

2497 J. von Heckel, Hofblumenfabrik * München * Artificial flowers and bushes.

2498 Josef Hinterseher, Sculptor * München * Bronze figures.

2499 Hugo Kaufmann, Sculptor * München * "Bronze upright clock."

2500 Karl Kiefer, Sculptor * München * Bronze: "A dog."

2501 L. Lichtinger, Atelier für kunstgewerbliche Metallarbeiten * München * Objects of comfort and use in tin.

2502 Georg Mattes, Sculptor * Nürnberg * Bronze: "Playing at ball."

2503 Prof. Friedrich von Miller * München * Jonas cup, cup of honour, silver figure.

2504 Hans Obermayer, Blumenfabrik * München * Artificial flowers and textures.

2505 Max Pfeiffer, Artist * München * Silver ornaments.

2506 Gebr. Pfister, Kgl. Bayerische Hofmarmorindustrie * München * Pillars, fire places, panellings of Bavarian Jura marble inlaid with onyx, marble floorings.

2507 J. J. Scharvogel, Kunstkeramiker * München * Art ceramics.

2508 Josef E. Schneckendorf, Atelier für kunstgewerblichen Schmuck * München * Jewellery in oxidized and silver gilt.

2509 Rudolf Schwarz, Sculptor * München * Bronze: "Paper weight."

2510 Steinicken & Lohr, Kunstgewerbliche Werkstätten * München * Bowls, vases, flowerstands, candlesticks, inkstands, &c. for writing table.

2511 Süddeutsche Lüsterfabrik * München * 5 Lustres.

2512 Karl Winterhalter, Kgl. Bayerischer Hofgoldschmied * München * Silver epergne from the household of H. R. H. Prince Rupprecht of Bavaria.

2513 Eduard Wollenweber, Kgl. Bayerischer Hofsilberarbeiter * München * Inkstand "Locomotive."

2514 Josef Zimmermann & Co., Anstalt für kunstgewerbliche Metallarbeiten * München * Teapot, bronze decorations for pillars and fire places.

Front-court.

2515 Josef Hinterseher, Bildhauer * München * Bronze: "Figure with roe drinking."

2516 Bayerische Kunststeinwerke des Württembergischen Portlandzementwerkes * Lauffen a. Neckar * Works at Lauffen

and München. Studios for sculptors at München. Cutting and sculpturing done in artificial stone.

2517 Marienberger Mosaikplattenfabrik, G. m. b. H. * Marienberg i. S. * Plate Coverings.

Niemeyer & Bertsch.

(Room 17.)

Reading Room.

2518 Adelbert Niemeyer & Karl Bertsch * München * Design of the room, furniture and entire fittings.

2519 Werkstätten für Wohnungseinrichtungen * München * Execution of all wood, joining, &c. work.

Bruno Paul * München.

(Room 33.)

Presidents' Study for the Government House at Bayreuth.

2520 Bruno Paul, Architect * München * Design of the room, furniture and entire fittings.

2521 Erzgiesserei "Renaissance" * München * Boys head (antique).

2522 J. J. Scharvogel, Art Ceramist * München * Ceramics.

2523 Vereinigte Werkstätten für Kunst im Handwerk * München * Outfit of room, and furniture.

Gebrüder Rank * München.

(Room 34.)

Presidents' Reception room for the Government House at Bayreuth.

2524 Gebrüder Rank, Architects * München * Design of the room, furniture and entire fittings.

2525 M. Ballin, Hofmöbelfabrik * München * Established 1863. Interior decoration of the room.

2526 Fritz Christ, Sculptor * München * Bronze "Salome," "Temptation."

2527 R. Kallenberg & Co. * München * Illumination sign boards.

2528 Josef Zimmermann & Co., Anstalt für kunstgewerbliche Metallarbeiten * München * Writing table fittings. Large Lustres.

Richard Riemerschmid * München.

(Raum 13.)

Directors' Room of Industry School at Nürnberg.

Richard Riemerschmid, Artist and architect * Pasing b. München * Design of the room, furniture and entire fittings. 2529

B. Kohlbecker & Sohn, Möbelfabrik * München * Fittings of the room and making of the furniture. 2530

Prof. M. Läuger * Karlsruhe * Art Ceramics. 2531

Linoleumwerke "Hansa" * Delmenhorst * Linoleum flooring. 2532

Prof. B. Pankok * Stuttgart * Silk woven cushion. 2533

Prof. Peter Behrens * Düsseldorf.

(Room 6.)

Reading Room of Town Library at Düsseldorf.

Professor Peter Behrens, Architect * Düsseldorf * Design of the room, furniture, wall decorations and entire outfit. 2534

Frau Lilli Behrens * Düsseldorf * Coloured paper for bindings. 2535

C. A. Beumers, Goldsmith * Düsseldorf * Face and enamelling of the clock. 2536

Rudolf Bosselt, Sculptor, Teacher at the Kunstgewerbeschule * Düsseldorf * Plastics in wood and marble. 2537

J. Buyten & Söhne, Möbelfabrik * Düsseldorf * Ceilings, panellings and furniture. 2538

Deuss & Oetker * Crefeld * Stuff for window curtains. 2539

E. H. Ehmcke, Artist * Düsseldorf * Designs for the coats of arms. 2540

Frau T. Frauberger und Fräulein Irene Frauberger * Düsseldorf * Wall carpets in application embroidery and coats of arms in relief embroidery. 2541

Harzheim & Hagen * Düsseldorf-Rath * Marble work in the niche with the clock, group of figures. 2542

Kgl. Färbereischule * Krefeld * Light-proof dying of the curtains. 2543

August Lucas, Wood carver * Düsseldorf * Carved figures. 2544

2545 A. Schmits * Düsseldorf * Furniture mounts and lamps, copper vessels.

2546 Hendrick & Carl Schultze * Düsseldorf * Leather covering and hand gilt of the furniture.

Arthur Biberfeld * Berlin.

(Room 51.)

Room for Young Lady.

2547 Arthur Biberfeld, Architect * Berlin * Studio for Art in houses and dwellings.

P. Ecke, Schmidt & Cie. * München.

(Room 56.)

Bedroom of the "Biedermeier" age.

2548 Designed by P. Ecke, Executed by Schmidt & Cie. * München.

Marie Kirschner * Berlin.

(Room 53.)

Lady's drawing room.

2549 Marie Kirschner, Artist * Berlin W. * Design for the arrangement and decorations, execution wall of the covering in painting and embroidery.

2550 Christoph Andreä * Mülheim a. Rh. * Velvet for the wall decorations.

2551 Barmer Teppichfabrik, Vorwerk & Co. * Barmen * Carpets.

2552 Oskar Fritz, Kunstschlosserei * Berlin W. * Brass work.

2553 C. Prächtel, Court joiner * Berlin * Seats.

Prof. W. Kreis * Dresden.

(Room 36 and 37.)

State room for the "Ständehaus" at Dresden and Ante-room.

2554 Prof. W. Kreis, Architect * Dresden * Design of the room, furniture and entire fittings, if not specially mentioned elsewhere.

2555 Frl. A. Angermann * Dresden * Wall applications, designed by Prof. Otto Gussmann.

2556 Dresdener Werkstätten für Handwerkskunst, C. Schmidt * Dresden * Complete outfit of furniture, execution of the wood and joining work.

2557 Gebr. Liebert * Dresden * Wall mosaics, designed by J. Goller.

2558 Udluft & Hartmann * Dresden * Vitrines and study furniture for public building (Ante-room).

2559 Villeroy & Boch * Dresden * Majolicas to place over doors, lighting fittings, clock dials, moulded by Prof. Karl Gross and Schaale, sculptor.

2560 Werkstätten für deutschen Hausrat * Dresden * Various pieces of furniture, designed by Frl. Kleinhempel and Frl. Junge.

2561 Wurzener Teppich- und Veloursfabriken * Wurzen * Carpets.

2562 A. Berger, Jeweller * Dresden * Silver inkstand with enamel trimmings, enamelled penholder for the Council, designed and moulded by Erich Kleinhempel.

2563 Court bookbinder Oesterreich and Jeweller Berger * Dresden * Golden Book of the Town, cover with allegoric figure in mosaic of precious stones, designed and painted by Prof. O. Gussmann.

2564 Hofjuwelier Mau * Dresden * Inkstand, silver and gilt with ivory and stones, and penholder for the councellors, designed by Max Hans Kühne, architect.

2565 Pirner & Franz, Brass founder * Dresden * Ballot urn for the city council in silver and bronze, designed by Prof. Schumacher.

2566 Juwelier Milde * Dresden * Hammer and bell for the council in silver and ivory, designed and modelled by Gertrud Kleinhempel.

2567 Juwelier Bertrand * Dresden * Hammer and bell for the councellors, in copper and silver with intarsia, designed by Margarete Junge.

W. Kümmel * Berlin.

(Room 47.)

2568 W. Kümmel, Möbelfabrik * State cabin with adjoining bathroom for S.S. "Prinz Eitel Friedrich" of the "Norddeutscher Lloyd, Bremen." Designed by Fritz Sauvage of Berlin, architect.

Committee for the Leipsic Exhibition.

(Room 35.)

Music Room.

2569 Fritz Drechsler, Architect * Leipzig * Design and details of the room, panelling, organ loft, wardrobes, &c.

2570 Eduard Beyrer jun. * München * Bronze statuette "Marya Delvard." Original.

2571 Julius Blüthner, Hofpianofortefabrik * Leipzig * Grand-Piano.

2572 Carl Dürfeld * Chemnitz * Wall hangings.

2573 Walter Elkan * Berlin * Execution of bronze reliefs on grand-piano and handles on wardrobes.

2574 Prof. Hermann Hahn * München * Bronze statues "Adam," "Eve" and "Dancer." Originals.

2575 Johannes Hartmann, Sculptor * Leipzig * Models for Stucco on the side of Organ. Marble bust of Robert Schumann (Original). Plaquette of Klinger in cast silber. Bronze statuette of Rob. Schumann the composer. (Copy of the Schumann monument at Zwickau i. S.)

2576 Prof. Max Klinger * Leipzig * Marble bust of Franz Liszt and Richard Wagner (Originals).

2577 Georg Kolbe, Sculptor and Artist * Leipzig * Marble bust of Joh. Seb. Bach (Original).

2578 Felix Pfeifer, Sculptor * Leipzig * Plaquettes, medals and bronze figure "Eve" (Original).

2579 Fritz Rentsch * Leipzig * Wall hangings in application and painting.

2580 Rixdorfer Linoleumfabrik * Rixdorf b. Berlin * Floor covering.

2581 Saalburger Marmorwerk Rödel & Co. * Saalburg a. S. * Marble panelling and marble pillars for busts in Saalburg marble.

2582 Hermann Schreyer * Leipzig * Execution of Glass-paintings.

2583 F. A. Schütz, Kunstmöbelfabrik * Leipzig * (Art manager: Ludwig Caspar and H. Möckel.) Execution of the wood architecture (organ-loft, case panelling, cases for music, and upholstery); design and execution of the grand-piano and the movable furniture.

2584 Prof. Max Seliger * Leipzig * Designs for the painted glass-windows and the carpet.

2585 Paul Sturm, Sculptor * Leipzig * Models for the ornamental figures of the organ-loft and book-cases and for the bronze reliefs on the grand. Medals and plaquettes.

2586 Prof. Artur Volkmann * Rom * Marble relief "Orpheus among the animals" (Original).

2587 M. Welte & Söhne, Orgelfabrik * Freiburg i. B. * Organ works.

2588 Wurzener Teppich- und Velours-fabriken * Wurzen i. S. * Floor carpet.

2589 Hans Zeissig, Sculptor * Leipzig * Models for the figures of the movable furniture.

□ □ □

2590 Musikverleger Breitkopf & Härtel, Max Brockhaus, Ernst Eulenburg, Otto Forberg, Robert Forberg, F. E. C. Leuckart, C. F. Peters, J. Rieter-Biedermann und Bartholf Senff * Leipzig * Works by classical and prominent modern composers, and literature on Music.

□ □ □

Group of Artists, Magdeburg.

(Room 45.)

Gentleman's Study.

2591 Albin Müller, Architect * Design of equipment of the room and designs of objects executed by the following firms.

2592 Alb. Becker, Elektrotechnische Fabrik, founded 1865 * Light installation.

2593 Bretting & Römer * Cocoanut carpet.

2594 W. Dittmar * Window frames.

2595 Th. Encke, Möbel- und Parkettfabrik, begründet 1830 * Execution of wall-panelling with wardrobe, frames of entrance and niche with cupboard. Facette glasses and brass glazing W. Duchrow.

2596 Fürstlich Stolbergsches Hüttenamt * Ilsenburg * Artistic casting in iron.

2597 W. Grimpe * Side board.

2598 Herm. Heimster jun. * Manufacturer of art industry furniture. Execution of writing table (Patent B. Göbel, Freiberg), framework of chair and easy chair.

2599 Herm. Held Nachfl. * Mountings mounts and wall fountain.

2600 O. Henschel * Stucco-plastics with mosaics.

2601 Eduard Hueck * Lüdenscheid * Objects in tin and copper.

2602 R. Jahn, Kunstschmied * Lighting fittings.

2603 H. Jahns * Carvings to the above objects.

2604 R. Kaiser * Carvings on the cupboard.

2605 O. Killmey * Upholstering of the easy chair (registered) and the chair to writing desk.

2606 A. Laubisch, Kunstschmied * Casing for heating appliances.

2607 P. Meissner * Bookcase and table before sofa.

2608 H. Näter * Framework of sofa, chair and stool.

2609 C. Schoppmeyer * Cupboard.

2610 W. Schottstedt * Corner cupboard.

2611 H. Stahl * Cupboard and what-not.

2612 Paul Lang, Artist * Designs for the followings:

2613 Benecke & Lattey * Carpets, hand made Smyrna.

2614 Walter Buhtz * Writing cases and leather articles.

2615 Wilh. Duchrow, Court purveyor * Window above the divan.

2616 Paul Knüppelholz, Court purveyor * Upholstering of the sofas and chairs.

2617 Frau Minna Lang-Kurz * Table centres and antimacassars.

2618 Frl. Paula Langbein * Cushions.

2619 Herm. Liebau * Wrought brass fence.

2620 Peter G. Palis, Inh. Ramdohr Söhne * Curtains.

2621 Fr. und E. Seyfarth * Writing cases and leather objects.

2622 Fr. Steinhäuser * Hemleben (Thüringen) * Wall hangings.

2623 Paul Bürck, Artist * Designs for wall carpet and chief window.

2624 Wilh. Goergens, Kunstanstalt für Glasmalerei, Hofglasmaler Sr. Hoheit des Herzogs von Anhalt * Execution of the chief window.

2625 Gebr. Mengering * Exhibit of wall carpet, made by school of Art Weaving, Scherrebek.

2626 Hans und Fritz von Heider, Maler * Original work in lustre porcelain and soft china ware, special substance. Decor: handcarved relief, flamed glazings with gold veins, dead glazings, underglazing painting, cutting process.

Buckauer Porzellanmanufaktur * Dining and coffee service designed by H. and F. von Heider. 2627

Paul & Miller, Ofenfabrik * Fountain niceh and fire place, underglazing painting and stained glazings. Designed by H. and F. von Heider. 2628

Reps & Trinte, Kunstanstalt für plastische Bildwerke * Vases and sculptures after models by H. and F. von Heider and Carl Wegener, Sculptor. 2629

Werkstätten der Kunstgewerbeschule * Lithography (teacher: H. von Heider, printer: J. Schmidt). Book printing (teacher: F. Nigg). Ceramics (teachers: H. and F. von Heider). Original lithographs and vases. Also concerned in the making of the printed matter exhibited as well as in the execution of fountain niche, fire places, &c. 2630

A. Wohlfeldt, Buch- und Kunstdruckerei * Print of explanatory report with. 2631

Leo Nachtlicht * Berlin.

(Room 48.)

Reception room.

Leo Nachtlicht, Dipl.-Ing. Architekt * Berlin * Design of the room, furniture and entire fittings. 2632

Josef Baranek * Berlin * Art glazings. 2633

Else Oppler * Berlin * Embroideries. 2634

Probst & Boeker, Tischlermeister * Berlin * Execution of all woodwork and joinery. 2635

Reiss, Neumann & Gansereit * Berlin SO. * Lighting fittings. 2636

Otto Scheer, Metallbildhauer * Berlin * Art industry work, mostly wrought in metal. 2637

Walther Schmarje, Bildhauer * Schmargendorf b. Berlin * Sculptures. 2638

Reinhold Willner, Tapezier und Dekorateur * Berlin S. 90 * Decorations and upholstering. 2639

Summer residence of an Art connoisseur.

Professor Joseph M. Olbrich * Darmstadt.

This building, designed by Professor J. M. Olbrich, is situated in the main aisle of the German Art Industrial Section, and must be imagined as the model for a Summer residence, with park and garden surrounding it simply and effectively

laid out. To carry out the character of this Country house the rooms are so arranged, that though each has an individuality of its own, they give the impression of a harmonious whole. In the wings on either side of the fountain court lie the Baden, Wurtemburg and Alsace-Lorraine rooms, viz.: Reception room by Prof. Läuger, Karlsruhe; a hall for Ceramic Art by Prof. Hoffacker, Karlsruhe; a music room by Prof. Pankok, Stuttgart, and a large sitting room by K. Spindler, St. Leonhardt. This suite of rooms adjoins six rooms in the main body of the building. Their interiors, carried out entirely by Hessian artisans after designs by Prof. J. M. Olbrich, consist of: A large sitting room, drawing room, library, dining room and music and smoking room forming altogether the Hessian section.

Gray Sitting Room.
(Room 24.)
Designed by Prof. J. M. Olbrich.

Exhibitors:

2640 Ludwig Schäfer * Mainz * Furniture factory and decoration. Award Paris 1900. Wood work and furniture in oak, stained silvergray with intarsia. Wall panellings in semi-silk, handwork.

2641 J. A. Schuler * Mainz * Workshops for Art glazing. Stained glass windows.

2642 Ch. Fambach und Alb. Hagner, Workshops for Art glazing * Mainz * Decoration vessel in wrought copper, silver-plated.

2643 Ph. Reitmayer * Mainz * Enchaser. Workshops for metal art industry. Chimney-top wrought in copper partly nickel-plated.

2644 Grünwald und Köllner * Mainz * Marble. Stonework for the fire place.

2645 Friedrich Endner * Darmstadt * Workshop for art glazing. Small figural medal, erased and burnt.

2646 Gustav Nitsche, Artist * Darmstadt * Painting of ceiling and walls in oriel.

2647 Paul Haustein * Darmstadt * Member of the Künstlerkolonie. Art industry objects in vitrine.

2648 J. V. Cissarz * Darmstadt * Member of the Künstlerkolonie. Ornaments in vitrine.

2649 Frl. Riedel * Darmstadt * Embroiderer. Sofa cushion.

2650 Robert Macco * Heidelberg * Marqueteur. Card box.

Tea Room.
(Room 22.)
Designed by Prof. J. M. Olbrich.

Exhibitors:

2651 A. Bembé * Mainz * Court furniture manufactory, joinery, fire places, mosaics, metal works.

2652 Georg Karp, Court watchmaker * Darmstadt * Small upright clock.

2653 Louis Busch * Mainz * Bronze ware factory. Silver plate lustre.

2654 Frl. Appel * Darmstadt. * Teacher at the Alicenschule. Embroidery in the show wardrobe and on the furniture.

2655 Frl. Schiffel * Darmstadt * Embroiderer. Sofa cushion.

Dining Room.
(Room 25.)
Designed by Prof. J. M. Olbrich.

Exhibitors:

2656 Ludwig Alter * Darmstadt * Court furniture manufactory, joinery and furniture.

2657 J. L. Boysen * Darmstadt * Sculptor. Carvings on wooden parts of the Dining room.

2658 Hubert Bringer * Darmstadt * Studio for art embroidery. Curtains.

2659 Ph. Reitmayer * Mainz * Enchaser. Workshop for art industry metal goods. Wrought brass work on fire place.

2660 Delp und Karn * Mainz * Marble. Fire place decoration.

2661 Gailsche Dampfziegelei * Giessen * Glazed tiles in the fire place.

2662 Friedr. Endner * Darmstadt * Work shop artglazing. Oval window.

2663 K. A. Seifert * Dresden * Bronze ware factory. Fittings for lighting.

2664 Deutsche Lincrustawerke, Pallas-Marke, Gerhard & Co. * Höchst a. Main * Lincrusta for wall coverings in sitting rooms and on staircases.

2665 Eduard Hueck * Lüdenscheid * Tin ware factory. Tin ware in vitrines.

2666 Louis Noack * Darmstadt * Porcelain and fancy ware. Glasses in vitrines.

2667 Frl. Appel, Frl. Schippel, Frl. Riedel, Frl. Schnittspahn, Frl. Kress. * State carpet for H. R. H. the Grand Duke of Hesse.

Music Room.

(Room 26.)

Designed by Prof. J. M. Olbrich.

Exhibitors:

2668 Ludwig Schäfer * Mainz * Furniture factory. Award Paris 1903. Joinings and furniture in German peartree with leather covering.

2669 J. A. Schuler, Workshops for Art glazing * Mainz * Great window.

2670 Friedr. Endner, Workshops for Art glazing * Darmstadt * Square medal with Monogram G. L.

2671 Carl Mand * Koblenz * Court Piano maker. Fancy wall grand after Olbrich.

2672 Ph. Reitmayer * Mainz * Enchaser, Workshop for Art industry metal work. Chimneytop in copper.

2673 J. V. Cissarz * Darmstadt * Künstlerkolonie. Tempera wall paintings.

2674 Paul Haustein * Darmstadt, Künstlerkolonie. Framed pictures and wall paintings on wood.

2675 Frl. Appel * Darmstadt * Teacher at the Alicenschule. Embroidered Curtain.

2676 K. A. Seifert * Dresden * Factory for light fittings: Brass lantern.

2677 H. & J. Weber * Darmstadt * Stucco work.

2678 Robert Macco * Heidelberg * Rosewood box.

2679 Frl. Kress * Darmstadt * Embroiderer Sofa cushion.

Gentleman's Room.

(Room 27.)

Designed by Prof. J. M. Olbrich.

Exhibitors:

2680 Eduard Frei * Darmstadt * Speciality: Art joinery and furniture after designs by Prof. J. M. Olbrich, Darmstadt.

2681 Benz & Rast * Darmstadt * Art Industry workshop. Large glass window.

2682 J. V. Cissarz * Darmstadt * Lithographs and hand drawings.

2683 Georg Karp * Darmstadt, Künstlerkolonie * Court Watch maker. Small upright clocks.

2684 Deutsche Lincrustawerke, Pallas-Marke, Gerhard & Co. * Höchst a. Main * Lincrusta for covering walls, designed by Prof. J. M. Olbrich.

2685 Prof. L. Habich * Darmstadt, Künstlerkolonie * Bronze plastics.

2686 Eckerts Nachfolger * Darmstadt * Porcelain and fancy ware. Fittings for lights.

Library.

(Room 23.)

Designed by Prof. J. M. Olbrich.

Exhibitors:

2687 J. Glückert * Darmstadt * Furniture manufacturer by special appointment. Joinery and furniture. Curtains and embroideries.

2688 Deutsche Lincrustawerke, Pallas-Marke, Gerhard & Co. * Höchst a. Main * Lincrusta for wall coverings, designed by Prof. J. M. Olbrich.

2689 Prof. G. Schönleber * Karlsruhe * Oilpainting.

2690 Prof. Fr. Fuhr * Karlsruhe * 2 Tempera wall pictures.

2691 Prof. Hans v. Volkmann * Karlsruhe * Oilpainting.

2692 Gustav Kampmann, Artist * Karlsruhe * Oilpainting.

2693 Prof. Ludwig Habich, Sculptor * Darmstadt * Sculptures.

2694 J. V. Cissarz * Darmstadt, Künstlerkolonie * Objects in vitrine.

2695 Paul Haustein * Darmstadt * Objects in vitrine.

2696 Dr. Greiner * Darmstadt, Künstlerkolonie * Sculptures.

2697 Prof. Fridolin Dietsche * Karlsruhe * Sculpture "Hans Jacob."

2698 Prof. Hermann Volz * Karlsruhe * Sculpture "Repentance."

2699 Julius Bergmann * Karlsruhe * Oil-painting "Autumn Evening."

2699a Emilie Stephan * Karlsruhe * Oilpainting.

2699b Walter Strich-Chapell * Karlsruhe * 2 Oilpaintings.

2699c Helene Stromeyer * Karlsruhe * Oil-painting: "Anemone."

2699d Bertha Welte * Karlsruhe * Oilpainting.

C. Prächtel * Berlin.

(Room 55.)

Drawing Room of 1813.

2700 C. Prächtel, Court joiner * Berlin * Entire execution. Furniture in old mahogany with ebony veins and gilt bronze.

2701 Karl Hozák * Neuendorf-Nowawes * Carpeting.

Carl Spindler * St. Leonhardt bei Börsch.

(Room 21.)

Gentleman's Room.

2702 Carl Spindler, Artist * St. Leonhardt b. Börsch (Unterelsass) * Design and fittings of the room, panelling and furniture with wood intarsia. Grand Prix 1900.

2703 Charles Bastian * Strassburg i. E. * 2 Plateaus with inlaid tiles.

2704 Paul Braunagel und August Cammissar * Strassburg i. E. * Mosaic glass window, fire place window and screen glass filling. Gold medal Carlsruhe 1901.

2705 Désiré Christian & Sohn * Meisenthal in Lothringen * Art glasses, office fittings, bowl, &c.

2706 Ph. Elchinger & Söhne * Sufflenheim i. E. * Fire place, mounting of irisated tiles, vases of hard earthen ware and art pottery.

2707 E. Koeberlé * Strassburg i. E. * Cushions and chair coverings of decoloured plush.

2708 Marie Köchlin * Strassburg i. E. * Embroidered cushions and chair coverings.

2709 Luise Spindler * St. Leonhardt * Tapestry and wall hanging in application embroidery.

2710 Gebr. von Zschock, Kunstschlosserei * Strassburg-Neudorf * Fittings for lights.

Artists Club "Werkring."

a) Prof. Alfred Grenander * Berlin.

(Room 8.)

Reception Room.

Prof. Alfred Grenander, Architect * Berlin * Design of the room, furniture and entire fittings. 2711

Arndt & Marcus * Berlin SO. * Clock inlaid with metal and amber. 2712

W. Kümmel, Möbelfabrik * Berlin O. * Furniture. 2713

G. Leander * Berlin SO. * Silver table lamp inlaid with amber, silver plated lamps. 2714

S. A. Loevy, Bronzegiesserei * Berlin N. * Metal fire place, top and dogs, all the mounts, tea-tray and inkstand. 2715

Marmorwerke Balduinstein, Guido Krebs * Balduinstein i. H.-N. * Marble fire place and pillars. 2716

Ernst Nast * Berlin * Intarsia. 2717

(Room 9.)

Sitting Room.

Prof. Alfred Grenander * Berlin * Design of the room, furniture and entire fittings. 2718

A. S. Ball, Möbelfabrik * Berlin W. * Furniture. 2719

G. Leander * Berlin SO. * Table- and other lamps. 2720

Marmorwerke Balduinstein, Guido Krebs * Balduinstein i. H.-N. * Pillars of marble of various colours. 2721

Alfred Mohrbutter, Maler * Schmargendorf b. Berlin * Decorative pictures and fresco. 2722

b) Anton Huber * Charlottenburg.

(Room 11.)

Dining Room.

Anton Huber, Architect, Atelier "Patriz Huber" * Charlottenburg-Berlin * Design of the room, the furniture and entire fittings. 2723

P. Bruckmann & Söhne, Silberwaren-fabrik * Heilbronn a. N. * Clock and epergne. 2724

Elsa Huber * Mainz * Embroidered tapestry. 2725

Mathilde Huber * Mainz * Design for tapestry and painting for wall. 2726

2727 Otto Merz * Ravensburg * Curtains and wall hangings.

2728 C. Prächtel, Hoftischlermeister * Berlin * Furniture, Fire place and Decorations.

2729 M. H. Wilkens u. Söhne * Hemelingen * Complete silver table service: epergne, candlesticks, wine decanters, liqueur glasses, tray, knives, forks, spoons, &c.

c) Arno Körnig * Berlin.

(Room 10.)

Nursery with small night nursery.

2730 Arno Körnig, Architect * Berlin-Wilmersdorf * Design of the rooms, furniture and entire fittings.

2731 Rudolph Hertzog * Berlin C. * Entire furniture of the night nursery.

See advertisements p. 31.

2732 C. Prächtel, Court joiner * Berlin * Entire furniture of the day nursery.

d) Curt Stoeving * Berlin.

(Room 7.)

Hall of an Art connoisseur.

2733 Curt Stoeving, Artist and Architect * Berlin * Paintings statues, selfmade small plastics. Design of the room, furniture and entire fittings.

2734 Robert Caspari * Berlin W. * Leather upholstering.

2735 S. A. Hesslein & Co. * Nürnberg * Stuff for wall hangings.

2736 G. Krüger, Bronzewarenfabrik * Berlin, Prinzenstr. 21 * Silverplated ornaments on the furniture.

2737 G. Leander * Berlin SO. * Light for the fire place and corner pillar, mantle piece.

2738 Eugenie Reinhard * Berlin * Embroidered tapestry and portières.

2739 C. C. Schirm, Atelier für Email * Grunewald near Berlin * Inlayings of enamel in wood and metal, covering of fire place and doors in enamel.

2740 August Simon, Stuhlfabrik * Berlin * Seats.

2741 Schulz & Holdefleiss, Artistic blacksmith * Berlin * Hammered dogs and fire irons.

2742 Wilhelm Voigt, Möbelfabrik * Berlin * Furniture in yellow, polished birch.

e) Rudolf und Fia Wille * Berlin.

(Room 12.)

Boudoir.

Rudolf und Fia Wille * Berlin W. * Design of the room, furniture and entire outfit. 2743

Martin Jacobi, Fabrik moderner Beleuchtungskörper * Berlin W. * Fittings for lighting. 2744

W. Kümmel, Möbelfabrik * Berlin O. * Furniture. 2745

Royal Württemberg Central for Industry and Commerce * Stuttgart.

(Room 28.)

Music Room.

Prof. B. Pankok * Stuttgart * Design of the room, furniture and entire fittings. 2746

Prof. E. F. Berner * Stuttgart * Casket, inlaid, made in the Royal art industry workshop for teaching and experimenting. 2747

G. Adolf Bredow, Sculptor * Stuttgart * Art bronze and silver ring bowls, cast by Paul Stotz, art industry workshop, Stuttgart. 2748

Detmolder Stuckfabrik, Alb. Lauermann * Detmold * Ceiling in "stukkolin."

See advertisements p. 8. 2749

Eckstein & Kahn, Leinwand- und Tischzeugweberei * Stuttgart * Table cloth and curtains, open work. 2750

Frauenarbeitsschule Heilbronn * Embroidered sofa cushion. 2751

Frauenarbeitsschule Reutlingen * Embroidered sofa cushion. 2752

Frauenarbeitsschule des Schwäbischen Frauenvereins * Stuttgart * Embroidered sofa cushion. 2753

Frauenarbeitsschule Ulm a. D. * Embroidered sofa cushion. 2754

Germania Linoleumwerke, Bietigheim * Linoleum flooring. 2755

Emil Kiemlen, Bildhauer * Stuttgart * Bronze statuettes, cast by Paul Stotz, art industry workshop, Stuttgart. 2756

Gustav Kottmann, Möbelstoffweberei * Crefeld * Stuff for the upholstered furniture. 2757

Friedrich Mauthe * Schwenningen * One upright clock and 4 grandfather-clocks. 2758

B. Rudolph, Carver in ivory * Stuttgart * Busts, figures and reliefs of ivory. 2759

2760 **Val. Saile, Glasmalerei und Kunstverglasungen** * Stuttgart * Window pane with art glazing.

2761 **Schiedmayer, Pianofortefabrik** * Stuttgart * 1 Grand-Piano, case in old water oak, lid with marquetry and deep carvings; music stand.

2762 **Städtische gewerbliche Fortbildungsschule, weibliche Abteilung** * Stuttgart * Art potteries.

2763 **Daniel Stocker, Sculptor** * Stuttgart * Bronze statuettes, moulded by Paul Stotz, art industry workshop, Stuttgart.

2764 **Paul Stotz, kunstgewerbliche Werkstätte** * Stuttgart * Lustres, lighting fittings, art bronzes and ornaments.

2765 **Stuttgarter Möbelfabrik Georg Schöttle** * Stuttgart * Special factory for xylectipome furniture, execution of the joining and furniture in dead walnut.

2766 **Hermine Winkler, Werkstätte und Schule für Kunstweberei** * Stuttgart * Door hangings, in Scherrebek style, carried out by hand. See p. 468.

2766a **G. Wölfel** * Stuttgart * Largest and most efficient workshop for inlaid work (marquetry, Intarsia). 16 Electromotors. Last award: Paris 1900, gold medal. All inlaid work on the walls furniture and grand-piano. See German State Building p. 360.

See advertisements p. 10.

2. Single Exhibitors.

2767 **Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen"** * Berlin * See p. 399–401, 438, 440, 441, 457, 461 and 467.

2768 **Konrad Astfalck** * Wilmersdorf b. Berlin * Copies of series of "Kurfürsten" carpets, painted on gobelin linen. See German State Building p. 360.

2769 **Carl Baldes** * Frankfurt a. M. * Statues and stucco ornaments in the Food Exhibition.

2770 **Ernst Baumgart** * Südende bei Berlin * Marblework for mud bath installation ob the Kgl. Preuss. Domänenverwaltung. (Palace of Liberal Arts.)

2771 **Prof. Christian Behrens** * Breslau * Allegorical figures and groups, decoratlve plastics. See German State Building p. 359, 361 and 362.

2772 **Chem.-Techn. Fabrik. Dr. Alb. R. W. Brand & Co., G. m. b. H.** * Charlottenburg * Chemically stained marble plates in the Court of honour.

Detmolder Stuckfabrik Alb. Lauermann * Detmold * Stucco decorations of Stoccolin, Patented (German patent 129,440), fillgree, light, greatest clearness of the ornamental forms, highest plastic effect. Artistically got up catalogues (4) and works on ceilings (3). 230 workmen. Work done: Representation room of German Empire in the art industry department. Schlüter ceilings in German State Building. See p. 360 and 361. 2773

See advertisements p. 8.

Deutsche Steinindustrie Akt.-Ges., vorm. W. L. Schleicher * Berlin NW. * Marble, Granite and Syenit works. Marble table of blue Penteli marble and metal crusting. 2 Fire places with pieces of bronze work. See German State Building p. 359–361. 2774

Andreas Egersdörfer * Frankfurt a. M. * Teacher at the Städel Institute of Art: Decorative painting in Food Exhibition. 2775

H. C. E. Eggers & Co. * Hamburg * Safe and strong box builders. Iron superstructure and bridge building. Art foundry. Founded 1865. 300 Workmen. Extensive Export to the Tropics. World's Fair Paris 1900: gold medal. See German State Building p. 359. 2776

Eichheim, Kunstschlosser * München * Foot, hammered, for the marble tables of Brothers Pfister. 2777

J. Glückert, Hofmöbelfabrik, Grossherz. Hessischer und Kaiserlich Russischer Hoflieferant * Darmstadt * Reception pavilion of the firm Henschel & Son, Cassel. Entire interior and exterior execution after designs by Karzt & Fanghänel, architects, Cassel. See Transportation Building. 2778

Carl Grätz, Artist * Frankfurt a. M. * Decoration wall painting in the exhibition for Food Supply. 2779

Richard Guhr, Artist * Berlin * Sigmundshof 11 * Decorative fresco in the amber department. Ceiling paintings in German State Building. See p. 360 and grp. 37 p. 445. 2780

Viktor Hillmer, Kunstschlosserei * Berlin SW. 29 * Decorated bronze pillar, balustrade and railings. See grp. 33 p. 442. 2781

G. Jörissen, Marmorbruch Auberg und Wirbelau * Oberlahnstein * Door framings and wall coverings of polished Nassau marble, designed by Bruno Möhring, architect (vestibule). Sold in U. S. A. by Marble Quarrying and Importing Co., New York City and Albany (N. Y.). See advertisements p. 21. 2782

2783 L. Kayser, Tischlerei * Berlin, Kreuzbergstr. 30 * Art joinery. See German State building p. 359 to 362.

2784 Marno Kellner * Charlottenburg-Berlin * Studio for sacred and secular paintings. Ceiling paintings and decorations of the Brandenburg Chamber, also the other paintings in the German State building. Award: the Prussian silver State medal at the first German Bauausstellung (Exhibition for architecture), many testimonials. See p. 359, 361.

2785 Kimbel & Friederichsen * Berlin, Yorkstrasse 43 * Fittings of Gentleman's study and ante-room. See German State building p. 359, 360 and grps. 38 and 43 p. 458, 462.

2786 Prof. Max Koch, Lehrer am Kgl. Kunstgewerbemuseum Berlin * Potsdam * Paintings for decoration of reading-room of German State Building. See p. 360.

2787 Hermann Krause, Kunstschmiede und Schlosserei * Berlin, Thurmstr. 68 * Wrought ornaments and railings, made by machinery.

2788 Franz Krüger, Sculptor * Frankfurt a. M. * 4 German costume figures in the Food exhibition.

2789 C. A. Lang * Kelheim a. d. D. * Execution in Kelheim limestone. Special quarrying. Exhibit: Table of Kelheim limestone. See German State Building p. 359.

2790 Gustav Lind Nachf., Metallbildhauerei * Berlin, Genthiner Str. 3 * Bronze pillars and bronze railings in the Bath exhibition. See grp. 33 p. 443.

2791 Albert Maennchen * Berlin, Dörnbergstrasse 7 * Painting for the portal, painted wall hangings for the hall for ceramics.

2792 Theodor Martin, Architect * Frankfurt a. M. * Plan of Food supply exhibition.

2793 Opderbecke & Neese * Düsseldorf * Marble postaments in Penteli marble. See German State Building p. 361.

2794 Gebr. Pfister, Kgl. Bayer. Hofmarmor-Industrie * München * Marble tables, plates of Lindenhöhe marble.

2795 Georg Riegel, Kunstmaler * Nürnberg * Painting "The Nürnberg Hopmarket" in the Food Exhibition.

2796 Max Rossbach, Kunstmaler * Solln-München * Decorative wall paintings for the reading-room. See German State Building p. 360.

2797 Joseph Rummelspacher, Artist * Berlin, Anhaltstr. 14 * Decorative painting in the Alpine Undertaking "The German Tyrolese Alps." See p. 506.

2798 Philipp Otto Schäfer, Artist * München Copy of Pesne's painting "Frederick the Great and his sister as children." See German State Building p. 359.

2799 Robert Schirmer, Bildhaueratelier * Berlin, Schaperstr. 32 * Ornamental and figural decoration and execution of the ceramic hall and its façades. Models for ornamental stone carving. See grp. 11 p. 400.

See advertisements p. 30.

2800 Arthur Schulz, Bildhauer, u. Frau Martha Schulz * Berlin, Fasanenstr. 33 * Portrait busts of H. M. Emperor William II. in hunting uniform, and Prince Henry of Prussia. Plastics and decorations in the exhibition of the Royal Ministry of agriculture, forestry and domains.

2801 Helene Schulz * Berlin, Fasanenstr. 33 * Portraits and decorative filling pictures. See German State Building p. 360, 361.

2802 Schulz & Holdefleiss, Kunstschmiedewerkstatt * Berlin, Fennstr. 13 * Bronze railing in the chief staircase. See German State Building p. 360 and grp. 41 p. 460.

2803 L. Sobotta * Berlin, Hallesches Ufer 23 * Decorative paintings.

2804 August Unger, Artist and Designer * Berlin, Bernburger Str. 21 * Ceiling paintings in the German State Building and decorative paintings in the German wine restaurant. See p. 361 and 362.

2805 Vereinigte Württembergische Werkstätten für Kunst im Handwerk * Stuttgart * Paintings on the safe of J. Ostertag, Aalen.

2805a Hermann Verwiebe, Artist * Pankow * Portrait of the Great Elector and his consort Princess Louise Henriette. See German State Building p. 361.

2805b Emil Ziegler, Artist * Frankfurt a. M. * Decorative painting, rough painting and gilding, and sign boards in the Food Supply Exhibition.

Group 38.

Office and Household furniture.

2806 Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen" * Berlin * See p. 399 to 401, 438, 440, 441, 456, 461 and 467.

2807 Ludwig Alter, Hofmöbelfabrik * Darmstadt * Drawing room fittings vitrines, tables. See grps. 37 and 43 p. 445, 452 and 461.

2808 A. S. Ball, Möbelfabrik * Berlin W., Potsdamer Str. 27a * Furniture, sofas, tables, &c. See grp. 37 p. 454.

2809 **M. Ballin, Hofmöbelfabrik** * München * Founded 1863. Factory and studios for artistic interior architecture. Undertaking of complete furniture of rooms, palaces, hotels, villas, &c. in modern and historical styles. Highest awards at the exhibitions of Munich, Melbourne, Chicago, Turino. See German wine restaurant p.362 and grp.37 p.448.

2810 **A. Bembé, Hofmöbel- u. Parkettfabrik** * Mainz * Founded 1780. Speciality: Complete furnishing of villas, mansions, yachts, &c. References: North German Lloyd, Bremen; Hamburg-America Line, Hamburg; Mr. Adolphus Busch, St. Louis. See grp. 37 p. 452.

2811 **J. Buyten & Söhne, Möbelfabrik** * Düsseldorf * Furniture. See grp. 37 p. 448.

2812 **Adolf Dietler** * Freiburg i. B. * Furniture manufactory. Architect for interior decoration, by special appointment, knight of several orders. (Speciality: artistic interior architecture, about 150 workmen, founded 1857.) See grp. 37 p. 446.

2813 **W. Dittmar (Inh. Otto Lademann)** * Berlin, Molkenmarkt 6 * Founded 1836. Special workshops for joining, wood work, carving, drawing of furniture, painting, draperies. House for complete furnishing of interiors, according to the taste of the German cultivated public. See p. 377 and grp. 37 p. 445.

2814 **Dresdener Werkstätten für Handwerkskunst** * Dresden * Single pieces of furniture and complete outfits of dwellings, and all requirements of the house. Medals in Dresden, Paris, Turino. See grps. 37 and 41 S. 449 and 460.

2815 **P. Ecke, Schmidt & Cie., Malergeschäft und Werkstätte für dekorative Kunst** * München * Bed room furniture. See grps. 37 and 43 p. 449 and 462.

2816 **Th. Encke** * Magdeburg * Panelling and cupboards. See grp. 37 p. 450.

2817 **J. A. Eysser** * Bayreuth (Bayern) * Furniture factory, since 1847, by special appointment to several courts, many awards, among which gold medals Nürnberg 1882, World's fair Amsterdam 1883 and Nürnberg 1896 (Speciality: Furnishing of dwellings). See grp. 37 p. 447.

2818 **Eduard Frei, Kunsttischlerei** * Darmstadt * Reading- and writing table, stool, upholstered and covered. See grps. 32, 33, 37 and 43 p. 441, 442, 453 and 462.

A. Gehrig Wwe., Hofmöbelfabrik * Karlsruhe * Side boards, sofa. See grp. 37 p. 446. 2819

F. Gerstenhauer, Tischler * Karlsruhe * Garden benches. See grp. 37 p. 447. 2820

J. Glückert, Hof-Möbelfabrik, Grossherzogl. Hessischer und Kaiserlich Russischer Hoflieferant * Darmstadt * Entire interior fittings of representation hall in the State Building of South west German States. See grp. 37 and 44, p. 453, 456 and 463. 2821

W. Grimpe * Magdeburg * Corner-cupboard. See grp. 37 p. 450. 2822

Joh. Gumbold, Kunst- und Möbeltischlerei * Königsberg i. Pr. * Vitrines for the amber exhibition: Precious woods combined with amber. 2823

Herm. Heimster jun. * Magdeburg * Writing table (Patent Bernhard Göbel) and writing chair. See grp. 37 p. 450. 2824

Rud. Hertzog * Berlin C. * Furniture exhibition. See p. 359 and 362 and grps. 37, 43, 44 and 58 p. 455, 462, 463 and 468. See advertisements p. 31. 2825

Paul Hümer, Joiner * Berlin, Baruther Strasse 15 * Writing table. 2826

Jacobi & Kertell * Frankfurt a. M. * Cupboards for the Food Supply Exhibition. 2827

O. Killmey * Magdeburg * Adjustable writing chair. See grp. 37 p. 451. 2828

Kimbel & Friederichsen * Berlin, Yorkstrasse 43 * Furniture, figures, frames, upholsteries. See German State Building p. 359 to 361 and grps. 37 and 43 p. 457 and 462. 2829

Kohlbecker & Sohn, Möbelfabrik * München * Outfit of room and furniture. See grp. 37 p. 448. 2830

W. Kümmel, Möbelfabrik * Berlin O., Frankfurter Allee 47 * Furniture. See grps. 37, 43 and 75 p. 449, 454, 462 and 475. 2831

P. Meissner * Magdeburg * Book case and table. See grp. 37 p. 451. 2832

H. Näter * Magdeburg * Chairs and stools. See grp. 37 p. 451. 2833

J. L. Peter, Hofmöbelfabrik * Mannheim * Sofa, cupboard and stool. See grp. 37 p. 446. 2834

J. C. Pfaff, Möbelfabrik * Berlin, Zeughofstr. 3 * Vitrines and tables for the Exhibition of the ministry of agriculture. 2835

C. Prächtel, Court joiner * Berlin, Krausenstr. 31/32 * Furniture. See grps. 32, 33, 37 and 42 to 44 p. 441 449, 454, 455, 460, 462 and 463. 2836

Probst & Boeker, Joiners * Berlin, Maybachufer 5 * Joinery. See grp. 37 p. 451. 2837

2838 Ed. Puls, Eisenkonstruktions- und Kunstschmiedewerkstatt * Berlin-Tempelhof * Vitrines in iron and bronze for the exhibition.

2839 F. Ad. Richter & Cie. * Rudolstadt * Furniture in the nursery (Toy Hall). Designed by Arno Körnig, Wilmersdorf. See grps. 21 and 36 p. 416 and 445.

2840 Gebrüder Röhlich * Berlin, Beuthstr. 6 * Purveyors to H. M. Kaiser William II. Factory exists since 1837. Paris 1900 gold medal. Special factory for interior fittings of halls, drawing rooms, boudoirs in the following historical styles: Rococo, Louis XIV, Louis XV, Louis XVI and Empire. Ceilings, wall architecture, door panelling, &c. Exhibited in German State Building: 1. Large banquet hall, copy of the oak-gallery in the palace at Charlottenburg-Berlin. 2. Galloon Hall, also copied from the Charlottenburg Palace, doors carved in oak, remaining ornaments in Röhlich art material. See p. 361.

2841 Ludwig Schäfer * Mainz * Sitting room and music hall. See grps. 32, 37, 39, 41, 43 and 44, p. 441, 452, 453, 460 and 463.

2842 Shannon-Registrator-Co. (Aug. Zeiss & Co.) * Berlin W. * Manufactory of modern office fittings and writing materials founded 1884. Gold medal Worlds Fair Paris 1900 and many others. Diplomas as purveyors to 8 Courts. Sole proprietor Aug. Zeiss, Kgl. Preuss. Kommerzienrat, Knight of high orders. See German State Building p. 359 and 360.

2843 C. Schoppmeier * Magdeburg * Cupboard. See grp. 37 p. 451.

2844 W. Schottstedt * Magdeburg * Corner cupboard. See grp. 37 p. 451.

2845 F. A. Schütz, Hofmöbelfabrik; Inh. Caspar & Herwig * Leipzig * Workshop for modern art furniture. Founded 1841. All wood architecture, joinings, and the figural and ornamental carvings of the Leipsic music room are carried out by this firm. Furthermore carried out by this firm: All moveable furniture after designs by Caspar and Möckel, Architects. See grp. 37 p. 450.

2846 August Simon * Berlin SO. * Seats. See grp. 37 p. 455.

2847 H. Stahl * Magdeburg * Cupboard and what-not. See grp. 37 p. 451.

2848 H. Stroucken, Möbelfabrik, Inh. Josef Krebs und Architekt Hugo Koch * Krefeld * Flat writing table, stools and chairs after designs by Prof. Eckmann.

Stuttgarter Möbelfabrik Georg Schöttle * Stuttgart * Corner arrangements with upholstered seats, drawing room cupboard, table, easy chairs and chairs. Vitrines of the Orivit Co. Limited. See grp. 37 p. 456. 2849

Gebrüder Thonet * Berlin, Leipziger Str. 88 * Easy chairs of wood, garden chairs. See German State Building p. 362. 2850

Udluft & Hartmann * Dresden * Vitrines. See grp. 37 p. 449. 2851

Vereinigte Werkstätten für Kunst im Handwerk, G. m. b. H. * München * Fittings of room and furniture. See grps. 11, 14, 30 to 32, 37 and 47 p. 400, 401, 438, 440, 441, 448 and 465. 2852

Wilhelm Volgt, Möbelfabrik * Berlin NO., Weberstr. 3 * Established 1857. Furniture. See grp. 37 p. 455. 2853

Werkstätten für deutschen Hausrat * Dresden * Furniture. See grp. 37 p. 449. 2854

Werkstätten für Wohnungseinrichtungen * München * Outfit of room and furniture. See grp. 37 p. 448. 2855

Group 39.

Stained glass.

Josef Baranek * Berlin, Pallisadenstrasse 100 * Artistic glazing. See grp. 37 p. 451. 2856

Benz & Rast * Darmstadt * Artistic glazing. See grp. 37 p. 453. 2857

August Cammissat & Paul Braunagel * Strassburg i. E., St. Urban 20 * Artistic glazing: Silhouette of Strasburg. Fire-place-window. Screen glass-filling: Children of Alsace. Gold medals Carlsruhe 1901, exhibition of stained glass. See grp. 37 p. 454. 2858

Hans Drinneberg, Glasmaler * Karlsruhe i. B. * Stained window glass. Awarded first prizes. See grp. 37 p. 446 and 447. 2859

Wilhelm Duchrow * Magdeburg * Glass windows. See grp. 37 p. 451. 2860

Fr. Endner, Hofkunstglaser * Darmstadt * Glass windows. See grp. 37 p. 452 and 453. 2861

Paul Förster * Berlin W., Nürnberger Str. 44 * Institution for art stained glass. "Rose Queen," a glass painting for a villa or country house. 2862

Wilhelm Goergens, Glasmaler * Magdeburg * Glass windows. See grp. 37 p. 451. 2863

Heinrich Hahn * Frankfurt a. M. * Workshops for modern art glazing. "Joy of Life," "The dance." Art glazing of opalescent glass after designs by Prof. 2864

Hans Christiansen, Darmstadt. Greatest effect obtained by lead glazing without painting.

2865 R.C.Kœnigsberg * Schwerin i.M.* Glass staining, mosaic and art glazing for churches and private residences. Art glazing in opalescent glass. "Summer evening in Vierlanden."

2866 C. Prächtel, Court purveyor * Berlin, Krausenstr.32 * Stained glass windows. See grps. 32, 37, 38, 42 to 44, p. 441, 449, 454, 455, 458, 462 and 463.

2867 Val.Saile, Glasmalerei und Kunstverglasungen * Stuttgart * Window pane with glass staining and art glazing.

2868 Ludwig Schäfer, Möbelfabrik * Mainz * Ivory-opalescent-glazing and lead framing. Miniature glass pictures. See grps. 32, 37, 41, 43 and 44 p. 441, 452, 453, 459 and 463.

2869 H. Schreyer, Glasmaler * Leipzig * Glass windows. See grp. 37 p. 450.

2870 J. A. Schuler * Mainz * Workshops for art glazing. Stained glass windows. See grp. 37 p. 452 and 453.

2871 Gustav Schulze & Jost * Berlin, Friedrichstr. 16 * Art glazing in brass framing. "The Thought," art glazing in lead framing "Difficult Choice."

2872 A. Staudinger, Glasmalereianstalt * München * First awards for artistic execution, sacred and secular.

2872a Carl Ule, Anstalt für Glasmalerei, Verglasung und Glasmosaik * München * Window, "Guardian angel of German Empire," in lead framing.

Group 41.

Hardware.

2873 Ausstellung der Bernsteinindustrie. See p. 401, 440, 441 and 444.

2874 Alb. Becker * Magdeburg * Electric light installation. See grp. 37 p. 450.

2875 Louis Busch * Mainz * Lamps, night lamps. See grps. 33 and 37 p. 442 and 452.

2876 Dresdener Werkstätten für Handwerkskunst, Inh. C. Schmidt * Dresden * Window and door mounts. See grp. 37 p. 449 and 458.

2877 H. Frost & Söhne * Berlin SW., Wilhelmstrasse 6 * Lamps for the German State Building. See p. 359, 361 and 362.

2879 R. Jahn * Magdeburg * Lamps. See grp. 37 p. 451.

G. Krüger, Bronzewarenfabrik * Berlin, Prinzenstr. 21 * Furniture fittings. See grp. 37 p. 455. 2880

C. Müller, Kunst- und Bauschlosserei * Berlin, Alte Jakobstr. 78 * Wrought brass mounts with handles on the entrance doors. Mounts. 2881

J. Ostertag * Aalen (Württbg.) * Factory for safes. 200 hands. Established 1867. Prominent export. Awards: Chicago 1893. Jeweller's cupboard with art painting. 2882

Ludwig Schäfer, Möbelfabrik * Mainz * Lustre. See grps. 32, 37 to 39, 43 and 44 p. 441, 452, 453, 459 and 463. 2883

Otto Schlee * Biberach a. Riss (Württbg.) * Factory for metal goods and bronze castings. Lustres in all styles for electric light and gas. 175 hands. Established 1865. Holder of the Royal Saxon State Medal, gold, silver, &c. medals, awarded in Halle, Cassel, Stuttgart, Leipsic, Nuremberg, Chicago, Paris. (Palace of Liberal Arts.) 2884

Schulz & Holdefleiss, Art smith * Berlin * Gas lanterns and fire place dogs. See German State Building p. 362 and grp. 37 p. 457. 2885

K. A. Selfert, Kronleuchter- und Bronzewarenfabrik * Mügeln, Bez. Dresden * Bronze candles for electric light. See grp. 37 p. 453. 2886

Franz Spengler * Berlin, Lindenstr. 44 * Door mounts on the fittings of the German State Building, carried out by Röhlich Brothers. See p. 361. 2887

Süddeutsche Lüsterfabrik, G. m. b. H. * München 41 * Lamps. See grp. 37 p. 447. 2888

Gebr. v. Zschock, Kunstschlosserei * Strassburg-Neudorf * Lamps. See grp. 37 p. 454. 2889

Group 42.

Paper Hangings.

(Palace of Liberal Arts.)

Carl Schoening, Eisengiesserei und Werkzeugmaschinenfabrik, Aktiengesellschaft * Berlin-Reinickendorf * The works exist since 1857 and carry out the following specialities: part I and II Iron castings; manufacture of finest cast, engros articles made by machinery. Molten quantity 40–50,000 kg per day. Part III and IV Machine works. Manufacture of shaping machines and wall paper printing machines. The wares repeatedly received awards, and in 1896 the Royal Prussian State Medal. 2890

The following machines patented in all countries are among the exhibits: Oil-wall paper printing machine for 6 colours, oil wall paper priming machine with automatic machines for putting up in bales and appliances for making "Freilichttapete" after a printing method, patented in all countries. The machines print on an average 4–5,000 m per hour of unfading and washing hangings.

2891 Heinr. Ulhlein * Hannover * Factory of wall paper. Speciality: Hand painted wall coverings and stuff-like wall hangings. See grp. 43 p. 463.

2892 J. Zuber & Cie., K.-A.-G. * Rixheim (Oberelsass) * Established 1797. Manufacturers of high class hand- and machine-made paper hangings. Landscape and floral mural decorations. Embossed leathers, &c. Silk and Wool Flocks. Gold and Bronze grounds. Finest machine-made chintzes, tapestries, &c. Highest awards at the Paris, London and Chicago Expositions.

Group 43.

Carpets, tapestries and fabrics for upholstery.

2893 Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen" * Berlin * See p. 399–401, 438, 440, 441, 456, 457 and 467.

2894 Ludwig Alter, Hofmöbelfabrik * Darmstadt * Carpets and wall hangings. See grp. 37 p. 445, 452 and 457.

2895 Christoph Andreä * Mühlheim a. Rh. * Velvet. See grp. 37 p. 449.

2896 Frl. A. Angermann * Dresden * Wall applications. See grp. 37 p. 449.

2897 Barmer Teppichfabrik, Vorwerk & Co. * Barmen (Rhenish-Prussia) * Established 1884. Carpets: First class Wilton- and Brussels, piecegoods, staircase and seemless square carpets. Patent Smyrna and Schiran Victoria carpets. An excellent substitute for real oriental carpets. Upholstery stuffs: first class moquettes, fancy and plain plushes, velours de Gênes. Machinery: Patented looms for patent Victoria carpets. Patent Jacquard-card-cutting machines. Agent: Otto T. Schuller, Broome Street 450/452, New York. See German State Building p. 360, 361 and grp. 37 p. 449.

Benjamin & Co. * Berlin, Melchiorstr. 23 * Carpets woven by machinery after designs by modern artists. 2898

Benneke & Lattey * Magdeburg * Hand made Smyrna Carpet. See grp. 37 p. 451. 2899

Berliner Holzdrahtrouleausfabrik E. Boeck * Berlin, Reichenberger Str. 154 * Established 1875. Wood Wire Blinds are used as a protection from sun and rain for all kinds of windows, in museums, hotels, schools, houses, verandas, balconies, serres. They are also employed as shades for glass roofs, glass houses, green houses and shopwindows. To soften the roof light and as a protection from the sun, and as decorations for the ceilings and walls fireproof and painted Wood Wire Blinds, have been used in the Great Hall. Bronze room, Toy room and Amber room, together about 1,700 sq. m., of the German department of St. Louis Exhibition. Wooden wire strips to a length of 4–5 m are made by hand by means of a plane and then woven also by hand. In fact the whole work is hand production. Silver medal, Berlin Art Industry Exhibition. 2900

Bretting & Römer * Magdeburg * Cocoanut carpet as floor covering. See grp. 37 p. 450. 2901

Richard Butz * Magdeburg * Leather work. 2902

Delmenhorster Linoleumfabrik * Delmenhorst b. Bremen * Linoleum and Lincrusta in the Office of the commercial member of the Government Commission. See p. 360. 2903

Deuss & Oetker * Krefeld * Stuffs over the panellings. See grp. 37 p. 448. 2904

Deutsche Linkrustawerke, Pallas Marke, Gerhard & Cie. * Höchst a. Main * Lincrusta as wall covering. See grp. 37 p. 453. 2905

Deutsche Linoleum- und Wachstuch-Compagnie * Workshops: Linoleum factory Rixdorf and Eberswalde Linoleum works * Established 1882. Factory area 100,000 sq.m. 51 buildings, 29 steam engines and steam pumps. 2,000 h.p. 600 hands. Capital invested, about 7,000,000 marks (1,750,000 $). Products: Uni, granite, printed, inlaid. Special patent methods. Patent monopoly in all countries for Rixdorf parquette inlaid, special carpet Inlaid, marmolite inlaid. Awarded the "Kgl. Preuss. Staatsmedaille für gewerbliche Leistungen." Exhibits consist of raw material, half finished and finished products. 2906

2908 **Carl Dürfeld** * Chemnitz i. S. * Wall hanging with pattern. See grp. 37 p. 450.

2909 **P. Ecke, Schmidt & Cie., Malergeschäft u. Werkstätte für dekorative Kunst** * München, Wassmannplatz 8 * Carpet. See grps. 37 and 38 p. 449 and 458.

2910 **Eduard Frei, Kunsttischlerei** * Darmstadt, Grafenstr. 27 * Basra Carpet. See grps. 32, 33, 37 and 38 p. 441, 442, 453 and 458.

2911 **Germania-Linoleum-Werke A.-G.** * Bietigheim * 100,000 sq.m. area, 6,000,000 sq.m. capacity of output. Linoleum: plain, printed or granite up to 3 m width. Inlaid, Colours right through after original method. Best and newest patterns after first class artists' designs. Best technical finish. Purveyors to the German Imperial Navy and many Government and Civil Bodies. Exhibition Cabin in the Palace of Liberal Arts and the floor covering in the German State Building and a large part of the German Sections. See p. 359.

2912 **Th. Gotzes** * Krefeld * Velvet and Gold Brocade, Stamped stuffs. Hangings in gold and silk. Palace of Liberal Arts.

2913 **Adolf Grunow, Gebhardt u. Rössel Nachf.** * Berlin, Markgrafenstrasse 53 * Carpets. See p. 362.

2914 **Rudolph Hertzog** * Berlin C. * Oriental Carpets in the Palace of Art. Modern Carpets after Artists Designs. See p. 359, 362 and grps. 37, 44 and 58 p. 455, 458, 463 and 468.
See advertisements p. 31.

2915 **S. A. Hesslein & Co.** * Nürnberg * Furniture stuffs and Carpets. Sample Stock in Berlin, Hamburg, Cöln a. Rh. Extensive Store, always containing the latest novelties. See grp. 37 p. 455.

2916 **Karl Hozák** * Neuendorf-Nowawes near Berlin * Handmade Smyrna carpet. See grp. 37 p. 454.

2917 **Mathilde Huber** * Mainz * Embroidered Wall Carpet. See grp. 37 p. 454.

2918 **Georg Hulbe, Kunstgewerbliche Werkstatt für Lederarbeiten** * Hamburg, Lindenstr. 43/46 * Room of a wealthy Collector of objects in Leather. See grps. 14 and 34 p. 401 and 444.

2919 **Kimbel & Friederichsen** * Berlin, Yorkstrasse 43 * Carpets and hangings for walls of a gentleman's study and anteroom. See German State Building p. 359 and 360 and grps. 37 and 38 p. 457 and 458.

2920 **E. Koeberlé** * Strassburg i. E. * Cushion and Chair Covers in discoloured plush. See grp. 37 p. 454.

2921 **Gustav Kottmann, Möbelstoffweberei** * Crefeld * Material for upholstered furniture. See grp. 37 p. 455.

2922 **W. Kümmel, Möbelfabrik** * Berlin, Frankfurter Allee 117a * Window Curtains, Carpets and Wall hangings. See grp. 37 p. 75, 449, 454, 455, 458 and 475.

2923 **Kunststickereischule des Badischen Frauenvereins** * Karlsruhe i. B. * Tapestries. See grps. 14, 37 and 58 p. 401, 446 and 468.

2924 **Emma Läuger** * Lörrach (Baden) * Tapestry. See grps. 37 and 58 p. 446 and 468.

2925 **Linoleum-Fabrik (A.-G.)** * Maximiliansau, Rheinpfalz * Best Goods especially for hard wear. Specialities: Corselet Linoleum for the Imp. Navy. Cork linoleum absolutely sound deadening, warm and very durable (see Badisches Kunstgewerbe: Prof. Hoffacker, Billing and Läuger). Cork, sound deadening, warmth giving linoleum lining, speciality recommended for use with ornamental Jaspe. Wood and Carpet effect lasting. Jaspe on corkment is exhibited in the room of Rudolph Hertzog. Several larger orders of late: Club for officials dwellings (subsidised by the state): cork carpet with jaspe, granite, &c. 42,000 sqm. Lunatic Asylum Eglfing-München: 22,000 sqm. Rebuilding of the Kgl. Amtsgericht Dortmund: Jaspe and Uni, about 10,000 sqm. Siemens & Halske, Berlin: cork linoleum, 15,000 sqm. Reichstags-Präsidialgebäude, Reichs-Marine-Amt: cork linoleum, 3,000 sqm. each. Disconto Co., Deutsche Bank, Berlin, Bavarian Bank of Commerce, München: cork linoleum. Imp. German Post about 50,000 sqm. See grp. 37 p. 446.

2926 **Gebrüder Mengering** * Magdeburg, Alte Ulrichstr. 3 * Hand made wall hangings. See grp. 37 p. 451.

2927 **Noss & Lucas, Möbelstofffabrik** * Elberfeld * Woollen and silk stuffs for furniture and curtains, figured mohair plush. (Palace of Liberal Arts.)

2928 **C. Prächtel, Hoftischlermeister** * Berlin SW. 19, Krausenstr. 31/32 * Wall hangings. See grps. 32, 37 to 39, 42 and 44 p. 441, 449, 454, 455, 458, 460 and 463.

2929 **Eugenie Reinhard, Kunstweberei, Kunststickerei und Kunstgewerbe** * Berlin W., Courbièrestr. 9 b, I * Art embroideries

and portières, wall coverings. See grps. 37 and 58 p. 455 and 468.

2930 **Guido Roeder & Co.** * Ansbach i. Bayern * Hand made Smyrnas.

2931 **Sächsische Kunstweberei Clavilez, Aktiengesellschaft** * Adorf i. S. * Velvet.

2932 **Ludwig Schäfer, Möbelfabrik** * Mainz * Carpets. See grps. 32, 37 to 39, 41 and 44 p. 441, 452, 453, 459, 460 and 463.

2933 **Luise Spindler** * St. Leonhard (Unter-Elsass) * Wall carpet with applications. See grps. 37 and 58 p. 454 and 468.

2934 **Fr. Steinhäuser** * Hemleben i. Th. * Wall hangings. See grp. 37 p. 451.

2935 **Heinrich Uhlein** * Hannover * Stuff for wall hangings. (Palace of Liberal Arts.) See grp. 42 p. 461.

2936 **Wilhelm Vogel** * Chemnitz * Decorations of the entrances in the Palace of Liberal Arts, wall hangings and velvet in German State Building, after designs by leading German artists. Established 1837. Awards at all exhibitions exhibited at. 1,000 hands. See p. 359 and 361.

2937 **Wurzner Teppich- und Veloursfabriken** * Wurzen (Sachsen) * Hand made Smyrnas. 13 first awards. See grp. 37 p. 449 and 450.

2938 **W. Ziesch & Co.** * Berlin SO. * Art weavers to His Majesty the German Emperor and His Royal Highness the Grand-Duke of Mecklenburg-Schwerin. Manufactory of tapestries. Cleaning and repair of old tapestries. Established 1868; 1873 diploma of acknowledgement; 1879 diploma of honour; 1888 diploma of honour and medal, München; 1896 diploma of honour, silver and gold State medal, Berlin; 1900 diploma of honour and gold Government medal, Paris. See German State Building p. 360.

Group 44.

Upholsterers' Decorations.

2939 **W. Bernau** * Berlin * Stuff for wall hangings and upholsterers. See German State Building p. 360 and 361.

2940 **Hubert Bringer** * Darmstadt * Curtains See grp. 37 p. 452.

2941 **Robert Caspari** * Berlin, Motzstr. 72 * Leather upholsterings. See grp. 37 p. 455.

2942 **J. Glückert, Hofmöbelfabrik** * Darmstadt * Embroidered portières. See grps. 37 and 38 p. 453, 456 and 458.

2943 **J. v. Heckel, Hofblumenfabrik** * München * Flower arrangements, fancy hedges and various fancy trees. See grp. 37 p. 447.

2944 **Rudolph Hertzog** * Berlin C. * Curtains, embroidered flag and banners. See German State Building p. 359 and 362 and grps. 37, 43 and 58 p. 455, 458, 462 and 468. See advertisements p. 31.

2945 **B. Hochstetter, Blätter- u. Blumenfabrik** * Berlin * Artificial vine shoots and ivy.

2946 **Paul Knüppelholz** * Magdeburg * Upholsterings. See grp. 37 p. 451.

2947 **Otto Merz** * Ravensburg * Embroideries for wall hangings. See grp. 37 p. 455.

2948 **Hans Obermayer, Blumenfabrik** * München * Fancy pieces and hangings (Objects of decoration) artificial flowers. See grp. 37 p. 447.

2949 **Peter Georg Palls, Inh. Carl Ramdohr Söhne** * Magdeburg * Curtains. See grp. 37 p. 451.

2950 **C. Prächtel,** Court purveyor * Berlin, Krausenstr. 32 * Curtains. See grps. 32, 37 to 39, 42 and 43 p. 441, 449, 454, 455, 458, 460 and 462.

2951 **Ludwig Schäfer** * Mainz * Picture frames with cut glass. See grps. 32, 37 to 39, 41 and 43 p. 441, 452, 453, 459, 460 and 463.

2952 **Hendrick & Carl Schultze** * Düsseldorf * Leather covering and hand gilding. See grp. 37 p. 449.

2953 **Reinhold Willner, Upholsterer and decorator** * Berlin, Lindenstr. 93 * Upholsterings and decorations. See grp. 37 p. 451.

Group 45.

Ceramics.

2954 **A. G. Norddeutsche Steingutfabrik** * Grohn bei Bremen * Established 1869. Special works for glazed tiles for kitchens, bath rooms, hospitals, machine rooms, &c. Annual production about 20 millions of plates. (Mine building.) See grp. 116 p. 493.

2955 **Gustav Bähr, Architect** * Charlottenburg * Tilepress for making smooth and ornamented tiles and cornerpieces. (Mine building.) See grp. 116 p. 493.

2956 **Heinrich Baensch, Porzellanfabrik** * Lettin b. Halle * Fruit dishes and coffee service.

2957 **A. Bertuch** * Berlin W., Mohrenstr. 59 * Crockery outfit for the kitchen of the German wine restaurant. See p. 362.

2958 **Buckauer Porzellanmanufaktur** * Buckau * Hand-painted china, dining, coffee, and tea services. See grp. 37 p. 451.

2959 **Eckerts Nachf.** * Darmstadt * China. See grp. 37 p. 453.

2960 **Ph. Elchinger & Söhne** * Sufflenheim (Elsass) * Office fittings, vases of hard-pottery. See grp. 37 p. 454.

2961 **Gallsche Dampfziegelei** * Giessen * Glazed stones. See grp. 37 p. 452.

2962 **Grossherzogl. Majolika-Manufaktur** * Karlsruhe i. B. * Vases, wallplates, artistically finished tile paintings, decorated wall tiles for exteriors and interiors, fire places, stones, &c., china painting. Art management: W. Süs, assisted by Prof. Dr. Hans Thoma, Director of the Grand Ducal picture galleries. General agent: C. F. Otto Müller, Kaiserstr. 144, Karlsruhe i. B. See grp. 37 p. 446 and 447.

2963 **Reinhold Hanke** * Höhr b. Koblenz * Purveyors to H. M. the Empress and Queen. Modern Rhine Pottery, showing artistically finished shapes accentuating the constructive idea and character of the material. Decorations in salt glazing, red of copper oxydul and other high fire glazings.

2964 **Rudolf von Heider, Sculptor, Teacher at the Kunstgewerbeschule** * Elberfeld * Art ceramics: Busts, animals, vases, objects of use. See grp. 14 p. 401.

2965 **Gebrüder Heubach, A. G.** * Lichte bei Wallendorf (S.-M.) * China factory, founded 1870. Paintings, art and fancy china, bisque figures, toy services, toys. 500 workmen.

2966 **Porzellanfabrik Markt-Redwitz, Jaeger & Cie.** * Markt-Redwitz in Bayern * Founded 1897. 300 hands. Speciality: Fine table ware of all kinds, and fancy objects. Most modern high fire colours, and both glazings.

2967 **A. W. Fr. Kister** * Scheibe (Schwarzburg-Rudolstadt) * Manufacturer of China-ware. Established 1838. Export to all civilized countries. Representatives and show rooms in: Berlin, Hamburg, Copenhagen, Bucharest, Vienna, Milan, Madrid, Barcelona, Paris, Brussels, Amsterdam, London, New York. First awards at all Exhibitions, amongst others: Gold Medals in Porto Alegre 1881, Douglas 1892, Chicago 1893, San Francisco 1894, Brussels 1897. The works produce: Finest fancy goods, viz.: figures, busts, groups, vases, flower holders, clocks, candelabras, &c. in finest white bisque and decorated in various styles; further ecclesiastical goods, ornaments for grave stones, handles for canes, toys such as jointed babies, animals, &c.

2968 **Richard Klemm, Porzellanmalerei und Kunstanstalt** * Dresden, Tillmannstr. 11 * Founded 1869. Stylish common use and fancy china of all kinds. Many awards.

2969 **Königlich bayerische Porzellanmanufaktur** * Nymphenburg bei München * Table services. Services for coffee, tea, mocca coffee and dessert. Figures, groups, art and fancy articles. State articles.

2970 **Königliche Porzellanmanufaktur** * Berlin * Institution of the Royal Prussian Government for the benefit and advancement of the Ceramic Arts, founded by King Frederick the Great in 1763. —Board of management: Technical Director: Geh. Reg. Rat Dr. Heinecke Artistic Director: Professor A. Kips. Director for General Administration: Director Barenthin.—Trade Mark: Royal Sceptre in blue. Mark for the decoration: Royal Globe in red.—Artistic Porcelain Ware of various materials after designs of renowned artists, figures, jardinières, candelabras, clocks, vases, &c. decorated in different styles and techniques, especially dinner, coffee and tea-sets in elaborate decorations paintings on tiles for walls, vases in seger porcelain with oxyd of copper glaze (chinese red) paintings under glaze by Herr Schmuz-Baudiss.—Fire- and acid-proof apparatus for chemical purposes in laboratories or factories, cylinders for mills, porcelain parts for weaving- and other machines, drums and linings for grinding mills, pyroscopical cones for the measurements of high temperatures, porous vessels and slabs out of hard baked and acid-proof material for filtering and electrolytical purposes.—500 employees, representatives in the great cities in Germany and abroad. Highest awards in Chicago 1893, Berlin 1896, Paris 1900 (two Grands Prix) and many others. German State Building p. 360 and 361, Education p. 366, Mine Building, see grp. 115 p. 493, Liberal Arts Building, see grp. 23 p. 423 and 426 and grp. 140 p. 498.

2971 **Prof. C. Kornhas, Ceramist** * Karlsruhe i. B. * Architectural ceramics: Fountain in stone substance with tiles, &c. See grps. 14 and 37 p. 401 and 446.

2972 **Prof. Max Läuger** * Karlsruhe * Art pottery. See grps. 14 and 37 p. 401, 446–448 and in the Model City.

2973 **W. Magnussen** * Bremen * Stone substance and pottery work, kitchen board with all requirements, potteries in clay. See grp. 14 p. 402.

2974 **Marienberger Mosaikplatten-Fabrik** * Marienberg i. S. * Floor tile. See grp. 37 p. 448.

2975 **Gebr. Meinhold** * Schweinsburg, Sachsen * Majolica factory. Fancy vessels, wall fountains, wall plates. Entively new technics. Designs by artists.

2976 **Hermann Mutz, Kunsttöpferei** * Altona a. Elbe * Common use and fancy vessels of stained glazed high fire stone substance. See grp. 14 p. 402.

2977 **E. Nister, Kunstanstalt für graphische Reproduktionen** * Nürnberg * Metachromotypes for ceramic purposes. (Palace of Liberal Arts.)

2978 **Louis Noack** * Darmstadt * China. See grps. 37 and 47 p. 453 and 465.

2979 **Hermann Ohme, Porzellanfabrik** * Niedersalzbrunn i. Schl. * Crockery for common use and fancy articles after designs by artists.

2980 **M. Perkiewicz, Tonwerke** * Ludwigsberg b. Moschin See grp. 116 p. 493.
See advertisements p. 16.

2981 **Reps & Trinte** * Magdeburg * Institute for artistic plastic works in terracotta, cast marble, &c. Speciality: Figures for electric light. Soft china ware. See grp. 37 p. 451.

2982 **Ph. Rosenthal & Co., A.-G.** * Selb i. Bayern * Hard china, underglazings; art ceramics.

2983 **J. J. Scharvogel, Kunstkeramiker** * München * High fire ceramics and fire places. See grps. 14 and 37 p. 402, 436, 447 and 448.

2984 **F. A. Schumann, Hoflieferant** * Berlin W., Leipziger Str. 107 * China outfit for the German wine restaurant. See p. 362 and grp. 47 p. 466.

2985 **Franz Steigerwalds Neffe, Hofglaswaren-Manufaktur** * München * Majolicas. See grp. 47 p. 466.

2986 **Tonwerke Kandern** * Kandern * Fire places and wall flames, wall tiles, Prof. Läuger art potteries. See grp. 37 p. 446.

2987 **Villeroy & Boch** * Mettlach (Rheinpreussen) * Founded 1841. 7 branch works. 7,000 hands. 2,450 H.P. 46 awards at exhibitions, among others: 1876 Philadelphia; 1893 Chicago; 1900 Paris, Grand Prix. Mettlach stone goods, earthen ware, majolica, water works articles, crystal and glass. Agency and sample stock: H. W. Loewe, 66, Park place, New York. Mosaic plates, tiles, coverings, terracotta figures, architectural ornaments, pipes. Agency and sample stock: Charles Engelhard, 41, Cortlandt Str., New York. In the German State Building: Flooring of the verandah and the terrace. See p. 360 and 361 and grp. 37 p. 449.

2988 **Wächtersbacher Steingutfabrik, Abteilung Chr. Neureuther** * Schlierbach b. Wächtersbach (Bayern) * Tiles in high fire glazings.

2989 **Werkstätten der Kunstgewerbeschule, Keramik (Lehrer H. und E. v. Heider)** * Magdeburg * Fountain niche and fire places, &c., vases. See grp. 14 p. 402.

2990 **Wessels Wandplattenfabrik** * Bonn * Estd. 1895. Gold medal Düsseldorf Exhibit 1902. High class tiles of every description supplied. Huge assortment of majolica and art glazes; decorative tiles for furniture; glazed bricks.

Group 47.

Glass and Crystal.

2991 **Ausstellung der Vereinigten Werkstätten für Kunst im Handwerk, G. m. b. H.** * München * See p. 400, 401, 438, 440, 441, 448 and 459.

2992 **Désiré Christian & Sohn** * Meisenthal, Lothringen * Engraved art glasses, repeatedly covered, and glasses with ornamentation "between the glass layers." Awarded Paris 1900, St. Petersburg 1901, Turin 1900. See grp. 37 p. 454.

2993 **F. van Hauten Sohn, Metall- und Glaswarenfabrik** * Bonn, Meststrasse * Enamelled glass wares; glass wares mounted on metal. See grp. 33 p. 442.

2994 **Fritz Heckert** * Petersdorf i. Riesengebirge * Glass factory. Common use and fancy glasses. Preuss. Staatsmedaille for art industry productions. First prizes at Art- and Industry-Exhibitions. Founded 1866. 250 workmen.

2994a **Gebrüder Helzel** * Dresden, Bismarckplatz 13 * Pat. advertisement mirror.

2995 **Siegmar Lewy** * Berlin, Ritterstr. 24 * Galvanoplastically decorated art and fancy articles of glass, porcelain, &c. See grp. 31 and 33 p. 440 and 443.

2996 **Louis Noack, Hoflieferant** * Darmstadt * Glasses and vases. See grps. 37 and 45 p. 453 and 465.

2997 **Offenburger Glasmosaikwerke, G. m. b. H.** * Offenburg (Baden) * Mosaics for facades and interiors. German stained glass exhibition Karlsruhe 1901 gold medal. See grp. 37 p. 446.

2998 **Deutsche Glasmosaikgesellschaft Puhl & Wagner. Purveyors of the German Court** * Rixdorf * In the entrance hall, two designs in mosaic prepared by order of H. M. the German Emperor for the Castle of the Wartburg, representing episodes in the life of St. Elizabeth, from the series of designs by the historical painter Aug. Oetken. In the Court of honour, decorative mosaics from designs by Professor M. Seliger. The institution began in 1889 with the first attempts to introduce the art of glass mosaic work into Germany, and has since fulfilled a large number of orders for churches and monuments, amongst others for the Kaiser Wilhelm Memorial Church and the Cathedral in Berlin, for the Minster at Aachen, the Kaiser fountain at Constantinople, &c. Own glass-works for the production of mosaic materials. About 100 artists and experts employed. Gold State Medal of Prussia, and the Grand Prix, Paris.

2999 **F. A. Schumann, Court Purveyor** * Berlin W., Leipziger Str. 107 * Glass crystal work in the German Wine Restaurant. See p. 362 and grp. 45 p. 465.

3000 **Franz Steigerwalds Neffe** * München * Vases and glasses in ground and coloured glass. See grp. 45 p. 465.

3001 **Theresienthaler Kristallglasfabriks-Niederlage, Eduard Rau** * München * Industrial art glasses, vases and jugs.

Group 48.

Apparatus for heating.

3001a **Hildesheimer Sparherdfabrik, A. Senking** * Hildesheim * Kitchen ranges; kitchen utensils. See p. 362.

See advertisements p. 18.

Group 49.

Apparatus and methods for lighting, other than electric.

3002 **Deutsche Gasglühlicht A.-G.** * Berlin * Burners, incandescent mantles, chimneys. See German State Building p. 362.

3002a **Metallschlauch-Fabrik Pforzheim, G. m. b. H.** * Pforzheim * Draught-gas lamps in brass, designed by A. Hildebrand, professor at the Industrial Art School, Pforzheim.

3002b **Carl Typke** * Berlin * Wax candles. See p. 360.

Group 53.

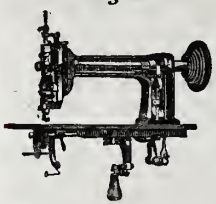
Equipment and processes used in sewing and making wearing apparel.

(Palace of Liberal Arts.)

3003 **Berliner Stickmaschinenfabrik Schirmer, Blau & Co.** * Berlin N. * Ten crank handle embroidering machines of different construction, and two three-needle embroidering machines (German patents) of different construction, in use. These machines are employed in the textile and clothing industries, upholstering, curtain and coverlet manufactories, military workshops, for banners and church embroideries, &c. Estbd. 1873. First factory of this kind in Germany. Many gold and silver medals awarded at exhibitions.



3004 **Lintz & Eckhardt** * Berlin O. 27 * Special factory for hand-crank embroidering machines. Manufacture of twenty-eight distinct systems for use in all branches of the textile industry. Eight hand-crank embroidering machines of different patterns exhibited, and also other patented "Pearl" embroidering machines, quilling machines. Founded 1877. About 120 workmen. Gold medal Frankfort a. M. 1881, Antwerp 1894, Paris 1900. Medal and diploma at Chicago 1893, and State Medal Munich 1898.



Group 54.

Threads and fabrics of cotton.

(Palace of Liberal Arts.)

3005 **Hugo Rudolph** * Walddorf (Sachsen) * Cotton curtains, wall hangings, bed coverlets, tablecloths, and towels. See grp. 55 p. 466.

Group 55.

Threads and fabrics of flax, hemp, &c., Cordage.

3006 **Eckstein & Kahn** * Stuttgart * Founded 1864. Linen and tablecovers. Modern damask table linen from designs by first class artists. Bed and table linen in fine open-work and hand embroidery. First-prize medals, Stuttgart 1896 and 1881, Philadelphia 1877, Vienna 1873, Moscow 1872, Ulm 1871, and Paris 1867. See German State Building, p. 361 and grp. 37 p. 455.

3007 **Hugo Rudolph** * Walddorf (Sachsen) * Staircase carpets. (Palace of Liberal Arts.) See grp. 54 p. 466.

3008 **Emil Schuhmacher** * Bielefeld * Table linen (table cloths, napkins, serviettes,

kitchen cloths) for the German Wine Restaurant. See p. 362.

3009 **A. E. Stiller & Sohn** * Seifersdorf bei Sorau N.-L. * Linen table covers, table cloths, napkins, towels, and dusters. (Palace of Liberal Arts.)

Group 57.

Silk and fabrics of silk.

3010 **Arnold & Braun** * Crefeld * Art weavers. Speciality: Medieval Altar cloths and tapestries church-ornaments. Silver medal Düsseldorf 1902, highest award for church hangings. Red silk damask in German State Building. See p. 361.

3011 **Erna Lundbeck** * Karlsruhe i. B., Belforter Str. 14 * Silk sofa cushions (with lithographic printing) and linen covers. See grps. 37 and 58 p. 446 and 468.

3012 **Vereinigte Glanzstoffabriken, A.-G.** * Elberfeld * Manufacture of artificial silk, artificial human hair and horse hair, imitation straw. Latest important inventions of the textile industry. 2,500 workmen. Large gold medal St. Petersburg 1903, Silver State Medal and gold Exhibition medal Düsseldorf 1902. Gold medal Zittau 1902. (Palace of Liberal Arts.)

Group 58.

Laces, Embroidery and Trimmings.

1. Joint exhibit of the lace and embroidery industry of Plauen.

Manager: Hofrat Prof. Hofmann, director of the Royal Artschool of Textile Industry, Plauen.

(Liberal Arts Building.)

3013 **J. G. Baier** * Plauen (Vogtland) * Established 1895. Embroidered lace in cotton and silk.

3014 **Wilhelm Berkling, Spitzenfabrik** * Plauen und Pausa i. V. (Sachsen) * Net and guipure laces, collars and shawls. Novelties and speciality. Awards, München 1888, Chicago 1893, Paris 1900.

3015 **F. L. Böhler & Sohn** * Plauen (Sachsen) * Established 1795. Mechanical weaving, hand and machine embroidery, lace making. Awards, Dresden 1825, London 1851, New York 1853, Paris 1855, 1867, &c. Laces, braid, plain goods, and collars in cotton and silk.

3016 **C. R. Eichhorn** * Plauen i. Vogtland * Novelties of every sort in guipures and net laces, cotton and silk. Awards, Munich 1888, Chicago 1893, Paris 1900 (Grand Prix).

3017 **Curt Hartmann & Co.** * Plauen, Annenstrasse 25 * Lace factory. Telegraphic address "Laces," Plauen. Established 1894. Number of workmen 190. Embroidered cotton silk laces, trimmings and collars of medium and finest qualities. Exports directs to all parts of the world.

3018 **Hess & Martin, Spitzenfabrikanten** * Plauen i. V.

3019 **G. A. Jahn** * Plauen i. V. * Novelties in net, guipure and chrochet laces. Speciality: embroidered robes, collars, scawes, &c. Awards, Paris 1867, Munich 1888, Chicago 1893, St. Petersburg 1903 (large gold medal, highest award), Paris 1900 Hors Concours, member of the international Jury. Agents: Berlin: Peter Paul Grimm, Jerusalemer Str. 62, SW. London: L. Shindheim, 45, Gutter Lane, E. C. Paris: Georges Jourdain, 32, Rue de Sentier. Established 1835, Successor of Carl Aug. Jahn.

3020 **Kempf & Paulus** * Plauen (Sachsen) * Embroidery, net laces, &c., in cotton and silk. Speciality: lace collars and other fashionable articles; highest qualities only.

3021 **Johannes Singer, Spitzenfabrik** * Plauen i. Vogtl. * Net and guipure laces, collars, &c. Novelties a speciality. Grand Prix de Paris 1900.

3022 **Ernst Timmel & Co.** * Plauen i. V. * Embroidered laces. Gold medal St. Petersburg 1902.

3022a **Wilhelm Weindler & Co.** * Plauen * Embroidered cotton and silk laces.

2. Single exhibitors.

3023 **Exhibit of the "Verein der Künstlerinnen und Kunstfreundinnen"** * Berlin. See p. 399 to 401, 438, 440, 441, 456, 457 and 461.

3024 **F. H. Ehmcke, Zeichner** * Düsseldorf * Designs for embroideries. See grp. 37 p. 448.

3025 **Frau T. Frauberger, Vorsteherin der Kunststickereischule, und Fräulein Irene Frauberger** * Düsseldorf * Applications and raised embroideries. See grp. 37 p. 448.

3026 **Frauenarbeitsschule** * Heilbronn * Embroidered sofa cushion. See grp. 37 p. 455.

3027 **Frauenarbeitsschule** * Reutlingen * Embroidered sofa cushion. See grp. 37 p. 455.

3028 **Frauenarbeitsschule des Schwäbischen Frauenvereins** * Stuttgart * Embroidered sofa cushion. See grp. 37 p. 455.

3029 **Frauenarbeitsschule** * Ulm * Embroidered sofa cushion. See grp. 37 p. 455.

3030 **Rudolph Hertzog** * Berlin C. * Estd. 1839. Gold State medal Berlin 1896. In the German State Building: Window decorations, lambrequins of silk with braid applications. Curtains of tulle and silk, ornamented with artistically finished point lace and pillow lace. Curtains of opaque silk like stuffs, trimmed with point lace and pillow lace. Before the German State Building: 2 large banners embroidered with the German eagle. Stores for ladies cloths, silk wares, white wares, linen washing, finishing of complete outfits, beds, tricots, ready made things for ladies and children, gentlemen's suits, ties, gloves, umbrellas, curtains, covers, linoleum. Workshops for interior decoration and upholstered furniture. Flags and banners made in special studios. See p. 359, 362 and grps. 37, 43, 44 p. 455, 458, 462 and 463.
See advertisements p. 31.

3031 **Elsa Huber** * Mainz * Embroidered wall hanging. See grp. 37 p. 454.

3032 **Marie Köchlin** * Strassburg i. E., Grandidierstr. 1 * Embroidered cushions and chair coverings. See grp. 37 p. 454.

3033 **Kgl. Spitzenklöppel - Musterschule** * Schneeberg (Sachsen) * 5 pieces of hand made pillow lace.

3034 **H. Krüger Wwe.** * Schiffbeck b. Hamburg * Art embroideries. Flowers, butterflies in natural colours. Filligree ornaments. Estd. 1880. Gold, silver and bronze medals awarded. Articles were bought by the Germanische Museum, Nürnberg, Kgl. Gewerbemuseum, Stuttgart, Polytechnische Verein, Würzburg, &c. (Palace of Liberal Arts.)

3035 **Kunststickereischule des Badischen Frauenvereins** * Karlsruhe i. B. * Embroidered cushions. See grps. 14, 37 and 43 p. 401, 446 and 462.

3036 **Emma Läuger** * Lörrach (Baden) * Embroidered cushions. See grps. 37 and 43 p. 446 and 462.

3037 **Paula Langbein** * Magdeburg * Sofa cushion. See grp. 37 p. 451.

3038 **Minna Lang-Kurz** * Magdeburg * Table strips and needle work. See grp. 37 p. 451.

Erna Lundbeck * Karlsruhe * Sofa cushion. See grps. 37 and 57 p. 446 and 467. 3039

Prof. Joseph M. Olbrich, Architect * Darmstadt * Designs for art embroideries, needlework. Show carpet. See grps. 12 and 37 p. 401, 451–453. 3040

Else Oppler * Berlin * Embroideries, own designs. See grp. 37 p. 451. 3041

Eugenie Reinhard, Kunstweberei, Kunststickerei und Kunstgewerbe * Berlin, Courbièrestr. 9 b * See grps. 37 and 43 p. 455 and 462. 3042

E. Rentsch * Leipzig * Application with paintings in the Great Hall, toy department, flags and banners. Gold medal Dresden and Turin. See grp. 37 p. 450. 3043

Clara Ripberger * Dresden * Raffaels Sistine Madonna, embroidered. Original technic, own invention. Paris 1900 gold medal. 3044

Albert Schwarz * Ravensberg (Württemberg) * Curtains, blinds and stores, bed covers. (Palace of Liberal Arts.) 3045

Luise Spindler * St. Leonhardt b. Boersch, (Unter-Elsass) * Tapestry in application embrodery. See grps. 37 and 43 p. 454 and 463. 3046

Thiele & Steinert * Berlin C., Niederwallstr. 14 * Manufacturers of gold and silver wire, laces and military-goods in Freiberg, Sachsen. Estd. 1693, rebuilt 1884, fitted out with modern machines. Awarded first prizes at Sidney 1879, Melbourne 1880 and Chicago 1893; at Nürnberg 1885 silver medal and Freiberg i. S. 1894 the Sächs. Staatsmedaille. Exhibit: Antique fringes, &c. for walls, and lambrequins as well as for the furniture of the Brandenburg Chamber of the German State Building. See p. 361. 3047

Tröltsch & Hanselmann * Weissenburg a. Sand (Bayern) * Galloons for the Galloon hall of the German State Building, after antique designs. See p. 361. 3048

Hermine Winkler, Werkstätte und Schule für Kunstweberei * Stuttgart * Curtains, Scherrebek style. See grp. 37 p. 456. 3049

Group 60.

Leather, Boots and Shoes, &c.

(Palace of Liberal Arts.)

L. Hegermann * Berlin N. 20, Kolonialstrasse 18–19 * Branch-Office at 3050

Gloversville N.Y., 57 South Main Street. Established 1863. Gloveleather Manufacturer and Dyer. All kinds of gloveleather. (Liberal Arts Building.)

3051 **J. Heil** * Hamburg-Wandsbeck * Leather and sandal manufacturer, dyed leather for saddle and bag makers and sandals made of one piece. Most healthy and cheapest shoes. (Palace of Liberal Arts.)

Group 61.

Various Industries connected with clothing.

(Palace of Liberal Arts.)

3052 **Herkuleswerke, Korsett- und Spiralfederfabriken, G. m. b. H.** * Oberkaufungen near Kassel * Branches, factories, warehouses, &c.: Germany: Oberkaufungen and Helsa; Austria: Görkau in Bohemia; England: 5 Guildhall Chambers, London; France: Wm. Becker, 56 rue de Paradis, Paris; Russia: S. A. Blechmann & Sons, Riga; Denmark: S. Simonson, Copenhagen; Switzerland: Heinrich Mack, Basle; America: During the exhibition special agent in St. Louis. Spirals for corsets and dress bones of pianos string wires (Trade mark "Herkules"). Patented in all countries of the world. Best, healthiest, cheapest busk and spring for stays, unbreakable and will not rust. Acknowledged by medical men to be the most prominent invention in the line of stays and clothing. Sale so far more than 120 millions. Austrian Staatsmedaille Aussig 1903, gold medal at the permanent industry exhibition Leipsic 1901, gold medal of the German academy of fashions, Leipsic 1901, honour diploma at the exhibition for Hygiene, Insterburg 1902.

Plaut & Zoellner * Berlin * Collars, cuffs, blouses, &c. 3053

Carl Scherf * Limbach i. Sachsen * Factory established 1855. Well known House in finest Fabric Gloves. Speciality: Real Milanese Gloves in silk and Lisle thread. Export to all civilized countries. 3054

Patent-Flachswirkerei Cöln, Schönherr & Co. * Cöln on Rh. * Original Linen mesh Underwear. Founded 1890. 3055

Department E.

Machinery.

(Palace of Machinery.)

Group 62.

Steam Engines.

3067 **Düsseldorf-Ratinger Röhrenkesselfabrik vormals Dürr & Co.** * Ratingen near Düsseldorf * Ship's water-tube boiler (marine type) 900 h.p. Maximum working pressure 190 pounds te the sq. inch. Speciality: Water-tube boilers (for stationary and ship purposes) Dürr's system. (Boiler house.)

3068 **Elsässische Maschinenbau-Gesellschaft.** Kapital 14,400,000 Mark * Sitz Mülhausen i. E. * Branches: Grafenstaden i. Els. and Belfort (France). A 1,000 h.p. steam engine with piston sliding valve motion, Frikarts patent. Established 1826. About 9,000 workmen employed. Manufactures: 1. Steam engines, turbines, blast engines, locomotives and railway material. 2. All machines for the textile industry, Spinning, wearing, printing, bleaching, cotton, wool and silk dyeing. 3. Machine tools. Awards in Paris 1900: 9 grand prizes and 4 gold medals.

Friedrich Goetze * Burscheid near Cöln a. Rh. * Copper and metal packing rings, metal packing for stuffing boxes; high pressure amatures. 3069

Alfred Gutmann, Aktien-Ges. für Maschinenbau * Hamburg-Ottensen * Established 1885. 1 sand jet blast with rotating table No. 35 for polishing castings, 1 sand jet blast for decorating glass, 2 mechanical filters, 1 cb.-metre and 20 cb.-metres, 6 rotary pumps, 4 ro- 3070

tary blasts. See grps. 64, 65 and 118 p. 471 and 494.

See advertisement p. 12.

3071 **Schäffer & Budenberg, G. m. b. H.** * Magdeburg-Buckau * Makers of Engine and Boiler Fittings. Established in 1850. About 3,000 hands employed in our head works at Magdeburg-Buckau and in our branch houses abroad. Branch Houses: New York, Chicago, Manchester, London, Glasgow, Paris, Lille, Milano, Liége, Zürich, Stockholm, Aussig, Hamburg and Berlin. Foreign Agencies: Vienne, Prague, St. Petersburg. Specialities: Pressure and Vacuum Gauges, yearly production about 200,000 gauges, Cocks, Valves of all description, Valves with Patent Nickel Seating for superheated steam, German patent No. 90,787. Safety and Reducing Valves, Steam Traps, Governors, Indicators, Counters for reciprocating and rotary motions, Original Restarting-Injectors over 150,000 in use. Pistonless Steam Pumps, Pumps of all kinds, Lubricators of the latest pattern, Thermometers, &c., Voit's Patent Steam Pumps. Highest prizes awarded at about 50 exhibitions, e. g. diploma and medal awarded at Chicago exhibition in 1893. See p. 373 and grps. 19 and 64 p. 414 and 471.

3072 **Schütte-Kessel-Konsortium** * Bremerhaven * A boiler, Schütte's patent, is exhibited at work in the boiler house; a second smaller one, intended for a launch is shown together with a machine of the G. Seebeck Co. Bremerhaven, in the transport Department. The advantages of the boiler are: 1. rapid development of steam, 2. slight weight, 3. saving of space, 4. impreved circulation of water, 5. economy in consumption of coal, 6. cheapness in construction. "Schütte"s patent boiler therefore offors great advantages both for stationary and marine purposes. As can be seen from the plans and photographs, the main boiler has lately been cylindrically constructed and the manufacture considerably cheapened thereby. The photographs also show 2 steam boilers of the most modern constructions, each having 170 sq.-metres heating surface, built for the steam yacht "Lensahn" belonging to H. R. H. the Grandduke of Oldenburg. The German patent has been sold to G. Seebeck Co. Bremerhaven. Details as to the disposal of the other patents to be obtained in German Department of Machinery Hall. See grp. 75 p. 475. See advertisement p. 28.

Stettiner Maschinenbau Akt.-Ges. "Vulcan" * Stettin-Bredow * Manufacturer of the marine steam boiler according to Schütte's patent in the boiler house. 3073

Group 63.

Various motors.

Gasmotorenfabrik Deutz * Original and oldest special manufactory for the construction of combustion motors, suction gas plant, motor pump works, motor locomotives for pit, field and street-railways, motor locomobiles, motor boats for conveyance of persons and freight, canal boats, &c. Established in 1869 by the inventors of the Otto four time motor, Dr. Nikolaus August Otto and Geheimrat Eugen Langen. 260 first medals and awards, 19 government medals. 70,000 motors with a total power of 400,000 h.p. supplied. Branch factories in Berlin, Vienna, Milano and Philadelphia. 22 own branch offices in various commercial emporiums of the world. Number of workmen in Cöln-Deutz: 3,000. Annual prodution 3,000 motors of 1—6,000 h.p. 3074

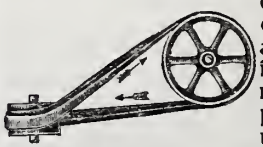
See advertisement p. 23.

Group 64.

General Machinery.

Max Eberhardt, Ingenieur * München, Goethestr. 74 * Fire extinguishing apparatus "Eberhardt." See German State Building p. 359 and grp. 22 p. 417. 3075

C. Otto Gehrckens * Hamburg * Established 1867. Factory for belting and technical leather articles. Tannery Horneburg (Hannover). Since 1869 the largest store of simple belting in the world (simple belting up to 1,000 m.-metres and double belting up to 3,000 metres in width always on hand). Special belting for dynamos, half cross and conical pulley driving; own German patent and patents in all foreign countries. Corner, half cross and left hand driving. 3076



Leather collars in:



Bowl shape,



Hat shape,



Channel ring.

The largest channel ring ever made in one piece of leather exhibited (manufactured from the largest hide exhibited in Paris in 1900). Walruss and other leathers.

3077 **Alfred Gutmann, Aktiengesellschaft für Maschinenbau** * Ottensen-Hamburg * Pumps. See grps. 62, 65 and 118 p. 469, 471 and 494. See advertisements p. 12.

3078 **Laboratorium für chemische Feuerschutz- u. Löschmittel, Conrad Gautsch, G. m. b. H.** * München, Subdirektion Berlin * Fire extinguishing apparatus. See German State Building p. 359 and grp. 22 p. 417.

3079 **Friedrich Lux** * Ludwigshafen a. Rh. * Frahm's distance tachometer. See p. 365 and 373 and grps. 19 and 23 p. 413 and 422.

3080 **Minimax-Apparate Baugesellschaft m. b. H.** * Berlin, Charlottenstr. 66 * Fire extinguishing apparatus. See German State Building p. 359 and grp. 22 p. 417.

3081 **Polte, Armaturen- und Patronenfabrik** * Sudenburg-Magdeburg * Fire brigade equipment, hose couplings, stand pipes, nossles. See grp. 76 p. 475.

3082 **Schäffer & Budenberg, G. m. b. H.** * Magdeburg-Buckau * General fittings for machinery. See p. 373 and grps. 19 and 62 p. 414 and 470.

Group 65.

Machine Tools.

3083 **Friedr. Dick** * Esslingen a. Neckar * Establ. 1778. 450 workmen. 300 horse-power. 50 gold, silver and bronze medals, among them Chicago 1893, the Royal State's Medals of Würtemberg 1896 and Bavaria 1898, &c. "Dick"-files for engineers, watchmakers, engravers, dentists, jewellers, &c. "Dick"-butcher-steels, knives, cleavers, carving-sets, table-sets, &c. Trade-marks: F.D. →E.DICK Sole agenty: John Chatillon & Sons, 85 Cliff Street, New York. See grps. 29 and 30 p. 437 and 438. See advertisements p. 27.

3084 **Alfred Gutmann, Aktiengesellschaft für Maschinenbau** * Ottensen-Hamburg * Sand jet blasts. See grps. 62, 64 and 118 p. 469, 471 and 494. See advertisements p. 12.

3085 **Orivit, Aktiengesellschaft für kunstgewerbliche Metallwarenfabrikation, vormals Rhein. Bronzegiesserei Ferd. Hub. Schmitz** * Cöln a. Rh. * Paris 1900 gold medal; Düsseldorf 1902 gold medal, silver government medal. Huber press for the shaping and decoration of seamless bodies in enclosed spaces; pressure of 6,000 atmospheres. 50 patents in all civilized countries, including 7 American patents. See grp. 30 p. 439.

3086 **H. Schlüter, Spezialfabrik für Lochstanzen und Scheren** * Neustadt am Rübenberg, Prov. Hannover * Machine for cutting, punching and stamping metals.

3087 **Friedrich Schmaltz, Schleifmaschinen- und Schleifräderfabr.** * Offenbach a. M. * Worlds Fair Paris 1900, Membre du Jury. Automatic sharpening and grinding machines of various kinds.

Department F.

Electricity.

Palace of Electricity.

1. German Education Exhibition (Chemistry and Electrochemistry).

Groups 68, 69 and 71.

See grp. 23 p. 417.

2. Single groups.

Group 67.

Machines for generating and using electricity.

3098 **Land- und Seekabelwerke, A.-G.** * Cöln-Nippes * Samples of cable, cable armatures, switch boards, high tension apparatus, &c. See grp. 70 p. 472.

3099 **Hugo Bremer, Neheimer Metallwaren- und Werkzeugfabrik** * Neheim on Ruhr * See p. 362 and grp. 69 p. 472.

3100 **Jul. Otto Zwarg** * Freiburg i. S. * Materials and apparatuses for protection of dwellings, churches, school, dynamite, powder and ammunition magazines, &c., from lightning.

Group 69.

Electric Lighting.

3101 **Allgemeine Elektrizitäts-Gesellschaft** * Berlin * Incandescent lamps in German State Building. See p. 359.

3101a **Hugo Bremer** * Neheim on R. * Machinery, metal goods and electro-technical factory. Inventor of the Bremer arc flame light, manufactured up to 50,000 candle power. According to scientific research the cheapest light of modern times. See German State Building p. 362 and grp. 67 p. 472.

3102 **C. Conradty** * Nürnberg * Factory of carbon points for electric continuous and alternating arc lamps, vacuum lamps and arc flame lamps, galvanic carbon, carbon sliding contacts, electrodes for electro-chemistry. Hugo Reisinger, New York, 11 Broadway, sole vendor for United States and Canada under his trade mark of "Electra." See German State Building p. 362.

3103 **Regina-Bogenlampenfabrik** *Cöln-Sülz* 400 hours burning time. Considerable saving of work. Burns constantly. Copying lamps for heliographic calking and photography. At 220 volts and 4 amperes more powerful than sunlight. Rosemeyer's construction is different to all known types of lamps, being completely hermetically enclosed, and it can stand any transport; it can be manipulated by a novice and gives a beautiful white tones of light. The enormous collection of heat within the inner glass causes the light obtained to increase by a standard candle per Watt. The sale of these lamps is very great in Germany and 150 workmen are also engaged in executing export orders for the whole world. The interior of the German State Building is illuminated with the indirect radiating shadeless Regina and its front with the direct radiating Regina arc lamp. See p. 359 to 361.

3104 **Siemens-Schuckertwerke, G. m. b. H.** * Berlin SW., Askanischer Platz 3 * Searchlight on the German State Building. See p. 362 and grps. 26 and 75 p. 428 and 475.

Group 70.

Telegraphy and Telephony.

3105 **Prof. Dr. Cerebotani** * München * Picture telegraph, printing telegraph, meteorological distant indicator.

3106 **Land- und Seekabelwerke, Akt.-Ges.** * Cöln-Nippes * Overhead wires, underground and submarine cables. See grp. 67 p. 472.

3107 **A. Silbermann, Metallwarenfabrik** * Berlin O. * Prof. Dr. Cerebotani's telegraphic apparatuses.

3108 **Ausstellung der Vereinigten Kgl. Preuss. und Grossh. Hess. Staatseisenbahnverwaltung.** See grp. 20 p. 416 and 473.

Group 71.

Various applications of electricity.

3109 **Deutsche Hygieneausstellung.** See p. 415, 416, 426, 428 and 494.

3110 **Hartmann & Braun, Aktiengesellschaft** * Frankfurt on M.-Bockenheim. See p. 368 and 373 and grps. 19, 23 and 140 p. 412, 421 and 497.

3111 **Keiser & Schmidt, Elektrische Mess-Instrumente** * Berlin. See grp. 140 p. 498.

3112 **"Magneta," Fabrik elektrischer Uhren ohne Batterie und ohne Kontakte, G. m. b. H.** * Singen (Amt Konstanz, Grh. Baden) * Electric clocks.

Department G.
Transportation.
(Palace of Transportation.)

1. Exhibit of the Vereinigte Kgl. Preuss. und Grossh. Hessische Staatseisenbahnverwaltung, Berlin (Groups 20, 74 and 138).

In Transportation Building:
Illustrations and Models of Social Welfare arrangements.

Outdoor exhibit on the Forsyth Ave.:
Arrangement of switches with track of rails.

The following exhibitors have contributed to this exhibition:

Group 20.
Medicine and Surgery.

3121 Berliner Krankenmöbelfabrik, E. Wulff & Hohmann * Berlin C. * Stretchers.

3122 Medizinisches Warenhaus * Berlin N., Friedrichstr. 108 * Life preserving box.

Group 74.
Railways: Yards, Stations, Freight houses and terminal facilities of all kinds.

J. Gast, Eisenbahnsignalbauanstalt * Berlin NO. 55, Greifswalder Str. 32 * Barrier at crossing. 3123

C. Lorenz, Telephon-, Telegraphenwerke und Sicherungsanlage * Berlin SO., Elisabethufer 5/6. 3124

See advertisements p. 19.

Siemens & Halske, Akt.-Ges. * Berlin * Switching and signalling gear. 3125

Zimmermann & Buchloh, Eisenbahnsignalbauanstalt * Berlin, Badstr. 38/39 * Signalling gear. 3126

2. Single groups.

Group 72.
Car and wheelwrights work.—Motor cars and bicycles.

3127 Benz & Co., Rheinische Gasmotorenfabrik, A.-G. * Mannheim * Benz Parsifal Motor car.

3128 Continental-Caoutchouc- und Gutta-Percha-Compagnie * Hannover * Established in 1872, 2,500 workmen and a staff of 300 clerks and engineers employed. All kinds of soft rubber articles manufactured, such as, tubing, packing, balls, gummed fabrics, balloons, &c. Speciality the wellknown "Continental Pneumatic" for bicycles and motor cars. Branches in all civilised countries. International Exposition Paris 1900 gold medal. Exhibits: Motor pneumatic tyres, latest pattern with and without safeguards. Further special types for bad travelling, as well as for racing cars; pneumatic tyres for bicycles. See grp. 19 p. 412.

Daimler-Motoren-Gesellschaft * Cannstatt * Zweigniederlassungen in Berlin-Marienfelde, Wien und Mailand. Sole manufacturers of the celebrated motor car "Mercedes." Factory for spirit, benzine and petrol motors, motor cars for convoyance of persons and freight. Motors for boats and motor launches, automobile rail vehicles, lowries up to 5 tons capacity. 3129

See advertisements p. 4.

Metall-Industrie Schönebeck, Akt.-Ges. * Schönebeck a. Elbe * Motor bicycle with self ignition. 3130

3131 **Mitteldeutsche Gummiwarenfabrik Louis Peter** * Frankfurt a. M. * Oldest Pneumatic-tyre Factory in Germany. Established 1872 by the present proprietor Louis Peter. Branch agencies in all large towns of the European Continent under management of the firm. Export to all civilised countries. Specialities: Peter's Union-Pneumatic for Cycles and Motor-cars. Peter's two-parted Patent-felloe for all kinds of tyres and wheels. Solid tyres for light cars and beary omnibuses. Indiarubber articles for all technical purposes. The firm is owner of impertant inventions patented in most civilited countries, and its manufactures obtained First Prizes at Exhibitions of this branch. See advertisements p. 25.

3132 **Franz Sauerbier** * Berlin SW., Friedrichstr. 231 * Factory for the Specialities: Cooling and condensing coils, patented in Germany. "Original Honeycomb-cooler." State Medal. Gold Medals.

Group 74.

Railways: Yards, Stations, Freight houses, terminal facilities of all kinds.

3133 **Friedrich Brüggemann** * Hannover, Hinüberstr. 11 * Method of compressing wooden railway-sleepers. (Forestry Building p. 490.)

3134 **Continentale Gesellschaft für elektrische Unternehmungen** * Nürnberg * Drawings and Models of the Barmen-Elberfeld-Vohwinkel Hanging Railway and of the projected Hanging Railways in Berlin, Hamburg and London.

3135 **Hannoversche Maschinenbau-Aktiengesellschaft vormals Georg Egestorff** * Linden vor Hannover * Established 1836. Limited Company since 1871. One 2/5 Atlantic type express engine with four cylinders, von Borries', Patent, constructed after designs of the Hannoversche Maschinenbau A.-G., with Pielock superheater; Model of a Pielock superheater, 2,500 Workmen, Output 400 locomotives yearly, Locomotives for any purpose and any width of gauge, steam engines, boilers, pumps. Grand prix Paris 1900.

3136 **Henschel & Sohn, Lokomotivfabrik, Maschinenbauanstalt und Kesselschmiede** * Kassel * Established 1817. Henrichshütte, Blast furnace for casting steel and iron near Hattingen in Westfalen, as well as coal mine adjoining. 5,300 officials and workmen. Main productions: Locomotives (more than 6,900 built), steam boilers, steam engines, nut presses (own patents), machine tools, electric cranes. Henrichshütte consists of blast furnaces, puddling furnaces, mills for rough and fine plates, bar and figured iron, tube works and steel mould foundry as well as extensive auxiliary works. Exhibits: 4 Locomotives—twelve wheel compound express locomotive, No. 6,260, Wittfeld type (3 cylinders) with bogy tender (150 kms. maximum speed), 14 wheel express compound tank locomotive for mountain lines, No. 6,601 (four cylinders), both ordered for the Prussian State Railways; four-wheel tender locomotive No. 6,616 for 4' 8½" in guage, efficiency 240 h.p., six wheel plantation locomotive No. 6,617, guage 3 feet, efficiency 45 h.p. See advertisements p. 14.

3137 **Max Jüdel & Co.** * Braunschweig * Fittings for Signalboxes and Signals.

3138 **G. Maas, Regierungs- und Baurat** * Berlin * Patented suspended rail-joint to diminish the jolting of railway cars. Patented semaphore with glass panels visible against any background.

3139 **Studiengesellschaft für elektrische Schnellbahnen, G. m. b. H.** * Berlin * Drawings of the cars and experimental track of the Swift Railways. Information as to the course and results of the experiments.

Group 75.

Material and Equipment used in the Mercantile Marine.

3140 **Hamburg-Amerika-Linie (Hamburg-Amerikanische Paketfahrt-Aktien-Gesellschaft)** * Hamburg * Steamship connection with the United States of America, Canada, the West Indies, Mexico, Argentine Republic, Brasil, East Asia, New York-West Indies, &c. Excursions to the Orient, to Norway, &c. Model of the skylight and the large dining saloon of the fast steamer "Deutschland," executed by J. C. Pfaff, Berlin. Complete model of fast steamer "Deutschland." Model of the Buildings on an area of 25,000 sqm. carried out by the Society for provisional Housing

of Emigrants until their ship leaves Hamburg. Shipping-Map of the World. Panorama with views of the countries and towns visited on the excursion voyages of the company.

See advertisements p. 32.

3141 **Hamburger Motorenfabrik C. Jastram** * Hamburg, Gr. Reichenstr. 45/47 * 4 HP. Double cylinder Benzine-motor with electrical ignition, rotating winged screw and drawings.

3141a **Howaldtswerke** * Kiel * Model of the Antarctic ship Gauss. See grp. 8 p. 389.

3142 **Florian Krajca** * Karlsruhe * Life-belt of indiarubber linea, 3 awards, used extensively; American patent on sale.

3143 **W. Kümmel** * Berlin O. 34, Frankfurter Allee 117a * Model of a ship. See grps. 37, 38 and 43 p. 449, 454, 455, 458 and 462.

3144 **G. Lehmann-Felskowski, Naval author** Berlin * Several volumes "The Shipbuilding Industry of Germany." Pictures of types of ships and of quay-buildings.

3145 **Norddeutscher Lloyd** * Bremen * Steamship Company. Regular fast and mail steamer connection with New York, Baltimore, Galveston, Cuba, Brazil, the Argentine Republic and the Mediterranean Imperial German Mail steamer lines to Egypt, East Asia and Australia. Excursions to the Orient, &c. Voyages round the world. Model of its new pier in New York. Model of the fast mail steamers "Kaiser Wilhelm II." and "Kaiser Wilhelm der Grosse." Transparency of the fast steamer "Kaiser Wilhelm II." Terrestrial globe. See grp. 26 p. 428.

3146 **Schütte-Kessel-Konsortium** * Bremerhaven * Steamer boilers, launch boilers. See grp. 62 p. 470.

See advertisements p. 28.

3147 **G. Seebeck, A.-G., Schiffswerft, Maschinenfabrik und Trockendocks** * Bremerhaven * Established 1877. The works consist of Shipbrights yard, Engineering works, Foundry, Boiler works and 5 Dry docks with large workshops for repairs. A launch engine connected with a launch boiler (Schütte's Patent).

3148 **Dr. von Seidlitz, Werkstatt zerlegbarer Boote** * Ebenhausen (Oberbayern) * Sailing boat. Patented in Germany, England, Norway, Sweden, Finland, Russia, North America.

3148a **Siemens-Schuckertwerke** * Berlin * Electrical Towing engine on the Teltow Canal. See p. 362 and grps. 26 and 69 p. 428 and 472.

3149 **Joh. C. Tecklenborg A.-G., Schiffswerft und Maschinenfabrik** * Bremerhaven-Geestemünde * Established 1841. 2,000 workmen. Area 240,000 sq.-m. Build passenger and freight steamers, engines, boilers sailing ships, &c. of all kinds and dimensions. Dry dock and Patent slip for repairs. Exhibits: Model of the Imperial Mail steamer "Neckar" of the North German Lloyd, model of the fivemaster "Preussen," the largest sailing ship in the world, and frame with views.

3150 **Westphalen, Propeller-Gesellschaft** * Berlin, Wilhelmstr. 43b * Ships' propellers, Westphalen Patent.

Group 76.

Material and equipment for the Navy; Naval warfare.

3151 **Polte, Armaturen- und Patronenfabrik** * Magdeburg-S. * Metal cartridges for infantry arms of every model. Daily output 250,000 cartridges. Cartridges for field guns and heavy ordnance from small to the largest calibres manufactured after the Polte rolling method. Projectiles and fuzes. Catridge-Machines Polte's system. Fire Brigade Appliances. Hose-Coupling. Standpipes, &c. See grp. 64 p. 471.

Group 77.

Aerial Navigation.

Exhibit of the **Deutscher Luftschifferverband** in co-operation with:

3152 **Augsburger Verein für Luftschiffahrt** * Augsburg * Wall map showing landing places for balloons.

3153 **K. von Bassus** * München * Apparatus for Balloon photography, Photogrammetric Views from balloon, Photographs from balloons.

3154 **Berliner Verein für Luftschiffahrt** * Berlin * 1 used balloon; 1 fully equipped balloon car; 1 wall map showing landing places for balloons; 1 atlas with reports of voyages; 2 year books of the Union; Instruct. for the presidents of societies.

3155 **Prof. S. Finsterwalder** * München * Patterns for cutting out spherical balloons, Description of a new method of Photogrammetry from Balloons (with map).

3156 H. W. L. Mœdebeck, Major * Graudenz * Scientific literary propaganda for the furtherance of aeronautics. 7 Volumes of „Illustrierte Aeronautische Mitteilungen." Established 1897. Published by K. J. Trübner, Strassburg i. E. Pocket manual for flying machine specialists and aeronauts. 2. Ed. 1904. Publisher Kühl, Berlin.

Münchener Verein für Luftschiffahrt * Wall map showing landing places for balloons. 3157

Department H.
Agriculture.
(Agricultural Hall.)

1. Joint-exhibitions
embracing several groups.

a) Exhibit of the German Agriculture.
Manager: Landesökonomierat Woelbling, Berlin.

Group 78.
Farm equipment and methods of improving land.

3168 Landwirtschaftskammer für das Herzogtum Oldenburg * Oldenburg * Portfolio with photographs of agricultural dwellings and farm buildings in the Grand-Duchy of Oldenburg.

3169 Deutsche Landwirtschafts-Gesellschaft * Berlin * Portfolio with drawings of a farm built by the German Agricultural Society.

Group 80.
Fertilisers.

3170 Deutsche Landwirtschafts-Gesellschaft * Berlin * 1. Graphic Representations of the consumption of crude Potassium salts for agricultural purposes in Germany in the years 1890, 1894, 1898 and 1902. 2. Portfolio with diagrams showing the employment of town refuse in agriculture. See grp. 83 p. 476 and 477.

Group 83.
Theory of Agriculture.— Agricultural Statistics.

3171 Deutsche Landwirtschaftsgesellschaft * Berlin * The Society was provisionally founded on 14. May 1884 and finally constituted with 2,940 members on 4 Dec. 1895. At presents its members number 14,000. Its object is to further the whole technique of agriculture by arranging yearly itinerant German exhibitions, by meetings, by testing machines, by assisting business connections, by giving advice in all technical agricultural questions and by issuing publications and circulars. It is divided for working purposes into 7 Departments and 30 Special Committees. 1. Graphic representation of the distribution of the members of the German Agricultural Society in Germany and of the significance of their itinerant exhibitions. 2. Portfolio with 17 plans of exhibitions of the German Agricultural Society. 3. The publications of the G. A. Society since 1886.

4. Graphic representation of the agricultural Associations in Germany. 5. Graphic representation of the production of grain in Germany. 6. Portfolio with tables showing the business transacted in manures, seeds and fodder through the mediation of the German Agricultural Society. 7. Graphic representation of the amount of live-stock in Germany in comparison with the area under cultivation. 8. Graphic representation of the amount of live-stock in Germany with reference to the population. 9. Nine typical photographs of horses. 10. Graphic representation of the German horse breeds and the public efforts to improve the breeds. 11. Twelve typical photographs of cattle. 12. Diagrams of the German cattle breeds and of the public efforts to improve the breeds. 13. Four typical photographs of pigs. 14. Two rotating collections of photographs of animals taken at exhibitions of the German Agricultural Society. 15. Diagrams showing the results of breeding the merino-sheep in Germany. 16. Diagrams illustrating the cultivation of the sugar-beet and the sugar production in Germany. 17. Graphic illustrations of the cultivation of the potato and of the manufacture of spirit in Germany. See grp. 80 p. 476.

3172 **Biologische Abteilung für Land- und Forstwirtschaft am Kaiserlichen Gesundheitsamte zu Berlin** * a) Information on the above; b) Model of the experimental field.

3173 **Direktor Dr. Hiltner, Kgl. Bayerische Agrikulturbotan. Anstalt** * München * The impregnation of the Leguminosæ with pure cultivations of organisms and its results.

Group 84.

Vegetable food products and agricultural seeds.

3174 **Deutsche Landwirtschafts-Gesellschaft** * Berlin * Collection of German Seeds.

3175 **C. Behrens & Co.** * Schlanstedt, Provinz Sachsen * Seed-corn, Sugar-beets.

3176 **A. Le Coq & Co.** * Darmstadt * Forestry and Agricultural Establishments. Speciality: Best selected grass and chover seeds also wood and field seeds.

3177 **E. Heine** * Kloster Hadmersleben (Bez. Magdeburg) * Cultivation of seeds for sowing since 1868; Original selected cultivations of sugar-beet seeds, yielding a maximum of sugar, and of most productive seed-corn.

3178 **A. Hoerning** * Volkstedt near Eisleben * Sugar-beet plants and seed, Sugar-beets in glasses. Seed-corn in glasses and in bunches.

3179 **W. Jäger** * Könkendorf near Sadenbeck, Prignitz * North German Champagne-rye; winter seed for dry places and years; for late sowing; with strong stalks.

3180 **O. Kirsche, Saatzüchter** * Pfiffelbach-Apolda * 1. Original beet-root "Ideal." 2. Oats. 3. Original "Square-head wheat."

3181 **Jacob Mayer I., Saatkartoffelgeschäft** * Frankenthal in Bayern (Rheinpfalz) * 193 varieties of potatoes.

3182 **Ludwig Mundt** * Timmenrode am Harz * Plants and seeds of grain and peas.

3183 **Rüben- und Getreidesamenzüchterei Rittergut Aderstedt** * Aderstedt-Gunsleben, Bezirk Magdeburg * 1. 50 kgs. Aderstedt Original sugar-beet seeds. 2. 50 kgs. Aderstedt Original sugar-beet seeds, husked and disinfected. 3. Aderstedt Original sugar-beets, preserved. 4. Illustrated pamphlet and water colour sketches from nature of beets affected with various discases; both being scientific work of the Experimental station of the obove firm.

3184 **O. Steiger** * Leutewitz (Saxony) * Seed improvement. Established 1825. Original produce: Square head Wheat, Golden Oats, Beets. Scientific selections: Quantity and quality. Laboratory, Garden for improvements, Experimental fields. Machines for cleaning and sorting driven by electricity. Largest yields, best qualities, great germinating power. Paris 1900: Grand prix. Victory prize and 4 large silver medals of the German Agriculturæ Society.

3185 **Fichtelgebirgs-Verkaufs-Genossenschaft** * Ansbach, Bayern * Farmers association with fields for seed improvements. Gold Medal Paris 1900. Seed-oats.

b) Exhibit of the Kgl. Preuss. Ministeriums für Landwirtschaft, Domänen und Forsten.

Business Manager: Geh. Ober-Regierungsrat und vortragender Rat im obengenannten Ministerium Dr. Müller, unter Beteiligung von:

Group 5.

Agricultural Education.

3188 Biologische Anstalt des Kais. Gesundheitsamts * Berlin NW., Klopstockstrasse 18 * Model of the experimental field in Dahlem.

3189 Ackerbauschule Badersleben, Provinz Sachsen * Photographic illustrations.

3190 R. Brendel * Kolonie Grunewald b. Berlin, Bismarckallee 37 * Models for instruction in botany.

3191 Otto Fennel Söhne * Cassel * Estd. 1851. Geodetical instrument Factory. Theodolites. Tacheometers. Levelling instruments. Mining compasses.

3192 Paul Gebhardt Söhne * Berlin C., Neue Schönhauser Str. 6 * Apparatus for instruction in physics. Experimenting table.

3193 Wilhelm Haferlandt & Co., G. m. b. H. * Berlin, Friedrichstr. 6 * Natural preparations for instruction in zoology, botany, entomology and mineralogy.

3194 H. Hauptner * Berlin NW. * Instrument Factory. Established 1857. Employs over 200 workmen for manufacturing veterinary instruments. Export to all civilised countries. Grand Prix and gold medal awarded at the International Exhibition in Paris 1900. Collection of instruments and means of instruction for agricultural colleges.

See advertisements p. 9.

3195 Haushaltungsschule Hameln (Provinz Hannover) * Photographic illustrations.

3196 Haushaltungsschule Nebra a. U. (Provinz Sachsen) * Photographic illustrations,

3197 Th. Kaulfusssche Buchhandlung P. Pfeiffer * Liegnitz * Established 1850. Collective exhibition of the means of instruction for country schools (Fortbildungsschule).

3198 Kgl. Bayrische Agrikulturbotanische Anstalt * München * Pure cultivations of nitrogen assimilating bacteriæ. Photographic illustrations.

3199 Kgl. Landwirtschaftliche Akademie Poppelsdorf-Bonn * Photographic illustrations, plans of situations, graphic representations, literary works.

3200 Kgl. Landwirtschaftliche Hochschule Berlin * Photographic illustrations. Literary works. 20 typical German land profiles. 30 different manures.

3201 Kgl. Preuss. Ministerium für Landwirtschaft, Domänen und Forsten * Berlin * Graphic representation of the higher, middle and lower agricultural and kindred educational and experimental Institutions in Germany. Graphic statistical plan of the extent of lower agricultural instruction in Prussia. Curricula of middle and lower agricultural Colleges. Statistics of agricultural and kindred educational institutes in Prussia. Memorial relating to night-schools.

3202 Max Landsberg, Bildhauer * Berlin, Margaretenstr. 7 * Models of the German breeds of cattle. Awards: Chicago 1893; Vienna 1890, Paris 1900, Munich 1899 (gold medals).

3203 Landwirtschaftskammer der Rheinprovinz * Bonn * Picture of a Rhenish horse.

3204 Landwirtschaftl. Winterschule Gross-Förste (Provinz Hannover) * Photographic illustrations.

3205 Landwirtschaftliche Lehranstalt und Haushaltungsschule Hagen i. W. * Headmaster: Dr. Kloepfer. 10 masters. 60 male and 32 female pupils.

3206 Landwirtschaftsschule Cleve (Rheinprovinz) * Models of agricultural implements.

3207 Landwirtschaftsschule Eldena (Provinz Pommern) * Means of instruction in knowledge of the soil.

3208 Landwirtschaftsschule Flensburg * Collection of articles of fodder in 52 glasses, arranged on an oak stand.

3209 Landwirtschaftsschule Hildesheim (Provinz Hannover) * Means of instruction in chemistry. Photographic illustrations.

3210 Landwirtschaftsschule Liegnitz i. Schl * Establ. 1873. Has now 245 pupils. Collection of 18 artificial sets of horses' teeth, from the age of 6 weeks to 18 years, for instruction in horse breeding.

3211 Landwirtschaftsschule Schlevelbein * Photograph of the Institute building.

3212 Gebrüder Micheli * Berlin NW., Unter den Linden 74a * Gypsum Busts.

3213 Milchwirtschaftliches Institut Hameln (Hannover) * 6 Photographs: the Institute building, lecture hall, laboratory, dairy, centrifugator room, cheesery.

3214 Dr. Robert Muencke * Berlin NW., Luisenstr. 58 * Means of instruction in knowledge of the soil and dairy-farming.

3215 Paul Parey * Berlin SW., Hedemannstrasse 10 * Text-books for instruction in middle and lower agricultural educational institutes. Wall-diagrams with pictures of enemies of plants. Pictures of breeds (Supplements to the Agricultural Press).

3216 Relt- und Fahrschule Elmshorn (Provinz Schleswig-Holstein) * Photographic illustrations.

3217 Hugo Voigt * Leipzig, Nostizstr. 9 * Text-books for instruction in middle and lower agricultural educational institutes.

3218 Wiesenbauschule Schleusingen * Teaches the cultivation of meadows. The models represent land improvements carried out by the school. Means of instruction may be procured from the management.

3219 Wiesenbauschule Siegen (Provinz Westfalen) * Models of meadow cultivation road making and irrigation works. Means of instruction for meadow cultivation and road making. Projects. Literature.

3220 L. Zwirner Nachfolger * Lautenbach (Baden) * Pomological atelier. Plastic imitations true to nature of varieties of fruit for educational purposes.

Group 78.

Farm equipment-methods of improving lands.

a) Land Improvement.

3221 Kgl. Preuss. Ministerium für Landwirtschaft, Domänen und Forsten * Berlin * Map of waterways in the North German river districts. Map of the land improvements in Prussia carried out with the assistance of public funds, one plan of each of the following: embankment and drainage systems, land reclaiming, joint drainage undertakings, correction of an un-navigable river, drainage and irrigation of meadows, pasturage for cattle, cultivation of waste land, drinking water supply.—Dubislar, Regulation of mountain brooks; Graf, The embankment inspectors on the Lower Rhine.

b) Cultivation of moors.

Anstalt Bethel * Freistadt near Varel * Peat hospital bed. 3222

Botanische Staatsinstitute Hamburg * The flora of the Eppendorf moor. 3223

W. Duckert * Freienwalde i. Pomm. * von Wangenheims Peat-moss roof German patent 78,047. Substitute for wood and cement roofs, no re-tarring required, cool in summer, warm in winter. 1 sq.m. weighs 20 kgs. 3224

Dr. Fleischer, Geh. Ober-Reg.-Rat * Berlin * Literary works. 3225

Adolph Franck * Charlottenburg * Carbon obtained from combustion of acetylene and carbon monoxide. U. S. Pat. 682,249. 710,335. 3226

Frau Gerson, Ökonomierat * Charlottenburg * Hand bore-rods. 3227

Emil Helbing * Wandsbeck * Artificial wood made from peat. 3228

Kgl. Hofkammer der Kgl. Familiengüter * Charlottenburg * Plan of a large farm on marshy soil. 3229

Landesdirektorium * Hannover * Plans, models, photographs. 3230

Kgl. Moorversuchsstation * Bremen * Fertilisation and cultivation experiments, models, apparatus for analysis, formation of moors, photographs, maps. 3231

Kgl. Preuss. Ministerium des Innern * Berlin * Model of Rendsburg Prison. 3232

Kgl. Preuss. Ministerium für Landwirtschaft, Domänen und Forsten * Berlin * Synoptical maps of the marshy areas in some Prussian provinces, maps and plans of land improvements carried out, graphic representation of the sinking of marshes, plans of marsh colonies, models and plans of moor buildings, oozy-places, experiment in wood-manuring with moor soil. 3233

Linksemsische Kanalgenossenschaft Lingen * Plans, graphic diagrams. 3234

3235 C. Marquardt, Ackergeräte- und Maschinenfabrik des Kgl. Landw. Instituts Hohenheim (Württb.) * Manufacture of agricultural machines and implements.

3236 Grossherzogliche Regierung Oldenburg * Models, photographs, Peat-charcoal kiln.

3237 Ossmers * Ahausen * Wooden horse-shoes.

3238 Precht * Moorhausen * Bird stuffed with white peat.

3239 Graf von Schwerin-Löwitz * Löwitz * Drawings of lake-dwellings.

3240 E. Seewald * Arnswalde * Plans for improving moor land.

3241 Otto Strenge * Elisabeth-Fehn * Drawings of a peat-cutting machine.

3242 B. Tolksdorf, Patentanwalt und Ingenieur * Berlin W., Luitpoldstr. 24 * Frost torches with fuse after Prof. Lemström-Helsingfors for preventing night frosts, prepared from turf and bituminous substances furthering combustion.

3243 Norddeutsche Torfmoorgesellschaft Triangel * Models, maps of cultivation and of the land, photographs.

3244 Ostpreuss. Torfstreufabrik Heydekrug, Aktiengesellschaft * Established 1882. State medal, Prizes of honour and First Prizes in Berlin, München, Magdeburg, Bremen, Münster, Königsberg, Posen, Insterburg, Tilsit. Yearly sale 5,000,000 kg. Export to Russia and Austria. 200 workmen. Speciality: Peat strewing and Peat dust for various purposes. Moss for bandages, bedding for hospitals, plaques for beerglasses, tinder, plates for collections of insects, &c.

3245 Verein zur Förderung der Moorkultur im Deutschen Reich * Friedenau * Established 1883, its sole object is to give owners of marsh land and peat expert advice for the agricultural improvement and industrial employment of their land. The Society is largely assisted by the authorities on account of its endeavours for the welfare of the community.

3246 Freiherr von Wangenheim, Rittergutsbesitzer auf Klein-Spiegel * The manorial estate Klein-Spiegel, situated in Pomerania, embraces in addition to mineral soil about 250 ha marsh land which is laid out in marsh-embankment plantations, meadows and pasturages.

3247 Westpreussischer Fischereiverein * Danzig * Publication: Fishing in marsh waters by Dr. A. Seligo, published by the Westpreuss. Fischereiverein. Danzig 1904.

3248 Westpreussisches Provinzialmuseum * Danzig * Drawings and photographs, model of a boat.

3249 M. Ziegler * Friedenau * Peat charcoal-burning.

c) Exhibit of the German Food Industry
(Groups 81, 85 to 90 and 92 to 95).

Management: Committee of the German Food Industry Exhibition at St. Louis. Frankfurt a. M., Neue Mainzer Str. 52.

Group 81.
Tobacco.

3252 Egyptian Cigarette Company G. m. b. H. * Berlin N.W., Passage 45/46 * Cigarettes and tobacco.

3253 Türkische Zigaretten- und Tabakfabrik "Sultan" * Breslau * Tobacco and cigarettes.

Group 85.
Animal food products.

3254 Deutsche Milchkonservenfabrik Walcker & Co. * Bremen und Loxstedt i. Hann. * Established 1883. Manufacture of sterilized milk. Purveyors to the Imperial German Navy, the North German Lloyd, the Hamburg-America Line, &c.

3255 Natura-Milchexportgesellschaft Bosch & Co. * Waren i. Meckl. * Milk and cream, sterilized in its natural state, of unlimited durability, for the tropics and at sea. Grand Prix Paris 1900. See grp. 90 p. 482.

3256 Troponwerke Mülheim-Rhein & New York 81/83 Fultonstreet * Manufacturers of highly concentrated albuminous food: Tropon (pure albumen), Irontropon (albumen with iron), Maltropon (albumen with malt).

3257 **Gebr. Wiedemann** * Wangen im Algäu * Algäu soft cheese factory. Speciality: fine soft cheese. Export to all parts of the globe, agencies in Luzern (Switzerland), Como (Italy) and London (E. C.) 16 gold medals.

Group 86.

Equipments and Methods Employed in the Preparation of Foods.

3258 **Deutsche Metall-Fräs- und Stanzwerke, Fiedler & Goldberg** * Dresden * Speciality: "Salvator" filtering floors for breweries, pressed yeast factory, straw stuff factory, up to 120,000 holes per square-metre.

3259 **J. M. Lehmann** * Dresden 28 * J. M. Lehmann Company, New York, 88/90 Walker Street * Manufacturer of machines. Machines for cocoa, chocolate, colour and toilet soap industries.

See advertisements p. 12.

3260 **Seck Brothers Ld.** * Dresden * Establ. 1873. 1,500 men. All kinds of milling machinery, autom. roller mill plants, malt cross mills, barley and malt cleaning plants. Highest awards: Chicago 1893, Antwerp 1894, Bruxelles 1897, Paris 1900. Exhibited are: Four roller break mill, iron emery scourer, middlings purifier "Reform," model of ring lubricators for toothed wheels, malt cross mill ("Seckmühle") with sieve balance "Chronos," Laboratory Mill for Malt analysis.

3261 **Guido Riedel** * Einsiedel-Chemnitz * House and kitchen fittings: Carver "Blitz," meet turner, potcarrier, knives, spoons, larding needles, cheese forks, cork levers.

Group 87.

Farinaceous Products and their Derivatives.

3262 **Theodor Haller** * Friedrichsdorf a. Taunus * Establ. 1883. Vermicelli (egg-paste) and macaroni; capacity daily 6,000 kgs. Gold medal Hamburg 1898, Paris 1900. First prize Mannheim 1902. See grp. 88 p. 481.

3263 **Hannoversche Kakesfabrik H. Bahlsen** * Hannover * Branches: Berlin, Hamburg, Frankfort-on-the-Main. About 700 hands employed. Specialities: Leibnitz "cakes," Leibnitz wafers, Leibnitz biscuits, Leibnitz fruits, &c. T E T wrappings, German patent. Leibnitz snow rolls. Patents: German Empire, England, France, Belgium, Switzerland, Italy, Austria, Hungary, Russia, Sweden, Norway, U. S. A., Canada, &c. Awards at Worlds fairs: Chicago 1893; Paris 1900, gold medal. See grps. 88-90 p. 481 and 482.

3264 **Ferdinand North** * Erfurt * Vermicelli (eggpaste) and macaroni factory. Establ. 1860. Special products: Genuine undyed vermicelli and finest hard granulated flour macaroni. Awards (12) at all Expositions exhibited at. Possessor of the Kgl. Preuss. Staatsmedaille for industrial merit.

Group 88.

Bread and Pastry.

3265 **Theodor Haller** * Friedrichsdorf * See grp. 87 p. 481.

3266 **Hannoversche Kakesfabrik H. Bahlsen** * Hannover * See grps. 87, 89 and 90 p. 481 and 482.

3267 **Alwin Mucke** * Dresden 16 * Universal export of Dresden Christmas "Stollen," dietary victuals, biscuits, rusks and pastry. Purveyor of hygienic bakers goods to fiscal and civic hospitals and sanatoria. Purveyor to numerous princely households. Holder of royal and princely licenzes. Chief specialities: Rusk "Queen Carola," biscuits "Princess Luisa," Dresden Christmas "Stollen," hygienic nutritious salt- and albumen pastry. Exported 1903 to U. S. A., Canada, Mexico, Argentinia, Brazil, Columbia, Guyana, Peru, Egypt, Cape Colony, German East Africa, South West Africa, The Cameroons, Zansibar, Asiatic Turkey, China, Kiautschau, British East India, Dutch East India, German New Guinea, New South Wales, Victoria, New Zealand, Marianes, Tonga Archipelago and to all European countries. Mucke's products were awarded 16 gold and State medals, fiscal and civic prizes of honour, Hon. diplomas, worlds fair Paris 1900 silver medal, exhibition of the Saxon mechanic art and art industry Dresden 1896, under the patronage of the king, highest award, only gold medal in the victual line. Trade

mark numbers 19,572, 47,024 and 63,780 patented. Sole sign on Mucke's wrappings: "Marke Königin Carola."

3268 **Carl Röder** * Dresden 9 * Court baker to His Majesty the king of Saxony, and purveyor to the Royal Court of Wurtemberg. Special export house for Dresden Christmas "Stollen." Rusks and finest Paris chocolate cake. Awards: Prize of honour Vienna, Jubilee exhibition 1898 and gold and silver medal at Hamburg and Hannover 1898.
See advertisements p. 29.

3269 **Harry Trüller, Zwieback-, Kakes-, Waffel- und Biskuitfabriken** * Celle * One of the largest biscuit factories of Europe. Awarded with gold and silver medals at many speciality exhibitions. Chief speciality: Natural butter biscuit "Victoria," supplied to many royal households in Europe, exported to all parts of the globe. Purveyor to the German Antarctic expedition. Machines and stoves of own patented inventions.

Group 89.

Preserved Meat, Fish, Vegetables and Fruit.

3270 **Heinr. Bauer, Hoflieferant** * Frankfurt a. M. * Factory for sausages and preserves. Speciality: Frankfort sausages. 8 branches here. 16 gold medals. Awards: Chicago 1893, Antwerp 1894, Paris 1900. General agent in North America: Meyer and Lange, New York. Export agent for all other countries: Harder & de Voss, Hamburg.

3271 **"Calorit," Warming of preserves without fire, Ld.** * Berlin * Preserves.

3272 **Halberstadt factory for sausages and preserved meat, Heine & Co.** * Halberstadt * Preserved sausages, meat.

3273 **Hannoversche Kakesfabriken H. Bahlsen** * Hannover * Jams. See grps. 87, 88 and 90 p. 481 and 482.

3274 **Adolf Jung** * Frankfurt a. M. * Meat and sausages, preserved.

3275 **Fleischwaren-, Wurst- und Konservenfabrik Heinr. Kuhlmann** * Bremerhaven * Ship outfits, export, military provisions.

3276 **Konservenfabrik Albert Rehse Sohn** * Wülfel vor Hannover * Estd. 1884. Own large asparagus, vegetable and fruit growths. Hands: 500. Purveyor to the German army and navy, also to the North German Lloyd, Bremen, makes vegetable, fruit and meat preserves, mixed pickles, fruit juices, jams, &c. furthermore preserves on a greater scale (dried vegetables and soup herbs), also as a speciality preserves with cooking arrangement (German Patent 105,590); favoured with the following wire from the Scandinavian trip of H. M. the German Emperor: "Your preserves with cooking arrangement have been tried on an outing into the hills which H. M. the Emperor made with some gentlemen of the suite yesterday and have proved very good. Although there was a strong wind on the 3,000 feet high snow-coverd top, the cooking arrangement worked so well that the meat could be eaten within a few minutes. Hausmarschall Freiherr von Lynker." These preserves are remarkable for taking up the least room, for the ease of the cooking apparatus and are very handy in manœvres, hunting and sport. Simplest handling, absolutly safe working! 58 different dishes always on stock! 1895 5 gold medals. World's Fair Paris, honourmention.

3277 **Casimir Spielmann** * Stuttgart * Factory for preserves and sausages. Estd. 1856. Export of Stuttgart sausages to all countries. Quality and durability warranted in all climates.

Group 90.

Sugar and Confectionary Condiments and Relishes.

3278 **Hannoversche Kakesfabrik H. Bahlsen** * Hannover * Jams. See grps. 87 to 89 p. 481 and 482.

3279 **Natura-Milchexportgesellschaft Bosch & Co.** * Waren in Mecklenburg * Solid extract of coffee. See grp. 85 p. 480.

3280 **Saline Lüneburg (Saline und chemische Fabrik)** * Lüneburg * All kinds of crystal salt, dining-, butter-, table salt, &c. Special brand: "Kronensalz."

Group 92.

Wines and Brandies.

A. Wines.

Joint Exhibition.

Manager:
Ökonomierat H. W. Dahlen, Wiesbaden.

3281 **Anheuser & Fehrs** * Kreuznach a. Nahe * Estd. 1869. Rhine, Nahe, Pfalz, Mosel and Saar wines in casks and bottles. Export to all zones. Holder of the protected stamp: "Kreuznacher Steinberg, Riesling, eig. Wachstum." Agent in U.S.A.: New York & Kentucky Co. 10 W. 232, Fifth Avenue, New York.

3282 **S. Bach, Weingrosshandlung, Weinbergsbesitz, Kgl. bayerischer und Kgl. preussischer Hoflieferant** * Neustadt a. Haardt * Award: World's Fair Chicago 1893, Paris 1900. Estd. 1862. Speciality: Rhinepfalz wines. Tasting opportunity: Tastinghall, department for victuals.

3283 **F. P. Buhl, Weingutsbesitzer** * Deidesheim * 10 Hocks.

3284 **Casino-Gesellschaft** * Trier a. d. Mosel * Wine merchants. Speciality: Mosel, Saar and Ruwer wines.

3285 **Friedrich Deister junior, Weingutsbesitzer. In Firma Friedrich Deister, Hoflieferant** * Gau-Algesheim a. Rhein * Own growths of 1893, 1895 and 1897, more than 20,000 litres of each to be disposed of. Only highest awards at World Fairs and other Expositions.

3286 **Gebrüder Drexel** * Frankfurt a. M. * Wine merchants. Chief cellars Frankfort o. Main, Grosse Gallusstrasse 21, branch cellars at Erbach o. Rhine, Leiwen-Trittenheim o. Moselle. Founded 1862. Formerly proprietors of the old Hôtel de Russie, (Zeil). By appointment Purveyors to His Majesty the German Emperor, King of Prussia; His Majesty the Emperor of Russia; His Majesty the Emperor of Austria; His Majesty the King of England; His Majesty the King of Italy; His Royal Highness The Grand Duke of Hesse; His Royal Highness the Grand Duke of Luxemburgh; His Royal Highness The Duke of Saxe-Coburg-Gotha; His Imperial and Royal Highness the Archduke Franz Salvator of Austria; His Royal Highness the Landgrave of Hesse; His Grandducal Highness Prince Carl of Bade. Distinguished by many awards, such as London 1862, Paris 1900, &c. also with the Silver Medal of Prussia. Furnishers to the International Sleeping Car Company.

3287 **C. F. Eccardt, Klosterkellerei** * Kreuznach (Rhineland) * Establ. 1840, Court purveyor, Wine Merchant, Sole proprietor of the Wine Estates: "Waltershof," "Grafenstein," "Klosterberg," "Felseneck," "Eccardt's Kauzenberg" and other excellent vineyards, about 150,000 grape vines. Shipper of Rhine, Moselle, Nahe, Pfalz Wines to all countries, largest to U.S.A. Trademark: "Horseshoe." 16 highest Awards, 2 from the German Agricultural Society for tropic-proof. Gold Medal Paris 1900. Exhibited Special registered Brands, own growths:
1893 Blume der Nahe,
1893 Prinz Heinrich Blume,
1895 Burg Felseneck Cabinet,
1893 Eccardt's Kauzenberg Cabinet,
1893 } Perle der Nahe (Nahetals Lobpreis),
1868 } of selected finest Riesling grapes.

3288 **Gebrüder Eckel** * Deidesheim (Rheinpfalz) * Sole proprietor: Kommerzienrat Fritz Eckel. Special vineyards in Deidesheim, Forst, Ruppertsberg, Wachenheim. Speciality: bottled wines.

3289 **Gebrüder Feist & Söhne** * Frankfurt a. M. * Whole sale wine merchants and champagne cellars, Hainerweg 37–53. Founded 1828. Export to all countries. 10,000 sq. m. cellars, partly two and three below each other. Vineyards in Worms (Liebfrauenmilch and Rauenthal.

3290 **Carl Gebert** * Ockfen a. Saar * Vineyard proprietor. 1. 1895 Bockstein. 2. 1900 Ockfen Herrenherz. 3. 1893 Geisterg.

3290a **Julius Gensterblum Wwe.** * Trier a. d. Mosel * Saar clarets.

3291 **Grossherzoglich Hessische Weinbaudomänenverwaltung** * Mainz * Vineyards in Bodenheim, Nackenheim Nierstein, Oppenheim, Dienheim, Ludwigshöhe, Bingen, Büdesheim, Kempten, Bensheim and Heppenheim, about 200 acres. Central cellars in Mainz (Rhine).

3292 **J. A. Harth & Co.** * Mainz * Wholseale wine merchants. Speciality: Rhinegau and Rhinehesse wines. Only sold to retailers. See advertisements p. 27.

3293 **Hinckel und Winckler** * Frankfurt a. M. * Shippers of Hocks and Moselles. Founded 1784. Keep magnificent stock of Rhine-, Palatinate- and Moselle-Wines. Light qualities as well as an excellent selection of the finest growths and the best vintages. Agents for the United States: C. H. Arnold & Co., 27, South

William Str. New York.—Suppliers to the German Restaurant, World's-Fair, St. Louis. See advertisements p. 15.

3294 **Gebrüder Hoehl** * Geisenheim a. Rh. * Champagne Cellars. Purveyors to the Bavarian, Roumanian, Italian and Hohenzollern Royal Courts. Established 1868. Special brands, Hoehl Kaiserblume, extra dry and Hoehl Champagne extra dry. Latest award the gold medal of the Paris Exposition, 1900.

3295 **Hoffmann, Heffter & Co.** * Leipzig * Wine importers and exporters. Sole agents on the American Continent of the original Z. V. G. Rheingauer Winzervereine, G. m. b. H., exports from Eltville a. Rhein, f. o. b. Rotterdam, Antwerp or Bremen. Twenty varieties of the same vintage exhibited in an outbuilding of the Agricultural Hall, stand E, grown in a single district. Price lists supplied. Samples for tasting at the general buffet. Principle of exhibit to show average brands of warranted pure and original wines of one vintage, 1900, grown in the chief wine district of Germany, the Rheingau, instead of picked high class brands. See advertisements p. 6.

3297 **Adolph Huesgen, Vine grower and wine dealer** * Traben a. d. Mosel * Choice Caseler of 1900, choice Wiltinger Schlangengraben of 1900, Steffensberger Blume of 1895, choice Steffensberger Löwenbaum of 1893. All wines of own growth.

3298 **J. W. Huesgen** * Traben a. d. Mosel * Established 1764. Wholesale wine dealer. Sparkling wines. Vineyards in Waldrach (Laurentiusberg), Enkirch (Steffansberg and Mannwingert), Traben, Trarbach, &c.

3299 **Max Huesgen, Vine grower and wholesale wine dealer** * Traben a. d. Mosel * Piesporter Goldtröpfchen of 1893, 1897, and 1900.

3300 **Adolf Jeremias, Vine grower and wholesale dealer** * Mainz a. Rhein * Three varieties of white, and one of red wine.

3301 **L. A. Jordan, Weingut** * Deidesheim, Forst, Ruppertsberg in der Rheinpfalz * Oldest wholesale producer of the Rhine Palatinate. Vinyards owned since 1747. First gainer of prizes for quality in the Palatinate (1783-1811). Sole posessor of the ground royalties of the Kingdom of Bavaria according to the official classification. One of the largest estates which grow high quality wines in the Empire of Germany. Twenty first prizes since 1793, among others gold medal Paris 1867, Progress medal Vienna 1873, medal Philadelphia 1876, two gold medals Melbourne 1880, and medal Chicago 1893. Three Bavarian State Medals. Appointed as member or chairman of comittees of award seven times. Ten choice varieties from own vintages of 1811 to 1900.

Reichsgräfl. von Kesselstatt'sche Majoratsverwaltung * Trier a. d. Mosel * Josephshöfer of 1893, Piesporter of 1893, Oberemmeler of 1893, and Caseler of 1895. 3302

Johann Klein, Vine grower and wholesale wine dealer * Johannisberg a. Rhein * Property in Johannisberg, Winkel, Geisenheim, Östrich, Mittelheim and Hattenheim a. Rh. Court purveyor to H. M. the Emperor of Germany. Only export business in the town. 3303

Kgl. Friedrich-Wilhelm-Gymnasium in Trier a. d. Mosel * Three varieties of white wine. 3304

Königlich Preussische Domänenverwaltung Berlin, Weinbau- und Kellerei-Direktion Wiesbaden * Rheingau * Vineyard property of 97 hectares. Most noted positions at Hochheim, Eltville, Rauenthal, Gräfenberg, Marcobrunn, Hattenheim, Steinberg, Rüdesheim, and Assmannshausen. Four spacious cellars, at Kloster Eberbach, Rüdesheim, Hochheim and Eltville. 3305

Pet. Jos. Kreuzberg & Cie. * Ahrweiler (Rheinl.) und Frankfurt a. M. * Wholesale wine dealers, with large vineyard property. Three varieties of red wine. 3306

Jakob Lintz * Trier a. d. Mosel * Vine grower. Wawerner Herrenberger of 1893, of 1899, and of 1900. 3307

Wilhelm Mahler, Vine grower and wholesale wine dealer * Worms * Established 1870. Owner of Liebfraumilch-Kirchenstück (registered number 31,022). Proprietor of the best Liebfraumilch positions, and excellent vineyards in Rhenish Hesse. Awards, Strassburg 1890, Worlds Fair Chicago 1893, St. Petersburg 1894, Giessen 1895, Darmstadt 1900, and Wiesbaden 1903. 3308

Guido Graf Matuschka-Greiffenklau * Schloss Vollrads near Winkel i. Rheingau * Vine grower. 3 varieties of white wine. 3309

Rud. & Wilh. Maucher * Neustadt (Rheinpfalz), Trier a. d. Mosel, Berlin * Purveyor to the Bavarian court. Owner of vineyard property. Three varieties of white wine. 3310

3311 **J. W. Meuschel sen., Purveyor to the Royal Court of Bavaria, vine grower at Buchbrunn (established 1828) and Rüdesheim (established 1863)** * Owner of vineyard property Schloss Steinburg, Würzburg. Large producer of own wines: ten presses at work. Specialities, finest Stein wines (registered Trade mark the "Bocksbeutel," German Imperial Patent No. 7,560, U.S.A. No. 24,501) and high class Rüdesheimer wines of own growing (registered Trade mark the sun, German Patent No. 7,843). Highest awards from international and local exhibitions, &c. Three grands prix, twenty-four gold, silver, and exposition medals, among others, Philadelphia 1876: ("The Franconia "Wines exhibited show great delicacy "in combination with a natural body "and strength, and are well made") and Chicago 1893: ("For a splendid "collection of very high class Stein "wines"). Purveyor to various courts, to first class societies and international companies, clubs and hotels. Exports to all parts of the world. Illustrations of the various kinds of vine grown in Franconia and their cultivation in the large nursery vineyards belonging to the firm.

3312 **Egon Müller** * Scharzhof b. Wiltingen * Best placed vineyards on the Saar, and consequently highest degree of cultivation of the very best varieties. E. Müller's wines reached the record price of 10,500 marks per "fuder" (about 980 liters) at the yearly spring auction at Trêves. Awards at the international exhibitions of Chicago 1893, and Grand Prix Paris 1900.

3313 **J. Neus** * Ober-Ingelheim a. Rh. * Vine grower and wine exporter. Rhine and Moselle wines, and Ober-Ingelheimer red wines. Sole owner of the Sonnenberg, Ober-Ingelheim.

3314 **Nohn & Söhne, Weingrosshandlung** * Waldhilbersheim bei Bingen a. Rh. und New York * Vineyard property at Waldhilbersheim, Heddesheim, and Münster near Bingen. About 1,000 as of vineyards. Established 1862. Exporter to North America since 1883. For many years the largest shippers of German wines to the United States. Export in 1900, 83,263 gallons (312,465 litres); 1901, 79,712 gallons (298,921 litres); 1902, 90,052 gallons (337,697 litres); 1903, 102,309 gallons (383,611 litres). Highest record for the Nahe district. New York office, 66–70 Beaver Street.

See advertisements p. 3.

3315 **Frau W. Rautenstrauch** * Karthäuserhof bei Eitelsbach * Vine grower. Three varieties of Eitelsbacher Karthäuserhofberg Riesling of 1897 and 1900.

3316 **Adolf Rheinart** * Saarburg, Bezirk Trier a. d. Mosel * Vine grower. Three varieties exhibited.

3317 **Richter & Co.** * Mülheim a. d. Mosel * Vine grower and wine dealer.
Choice Elisenberger of 1884;
Choice Elisenberger of 1893;
Choice Elisenberger Steinberg of 1897.

3318 **Roederer & Cie., G. m. b. H.** * Longeville * Largest Champagne cellars in Lorraine. Established 1893. Original vintages of Champagne and Lorraine. Four gold and one silver medal awarded in 1903 at various industrial exhibitions at home and abroad, as well as a cross of honour as highest award.

3319 **Wilhelm Ruthe** * Wiesbaden * Purveyor to H. M. the German Emperor, the Grand Duke Michael Michailowitsch of Russia, the Grand Duke of Mecklenburg-Schwerin and several other courts. Award at the Paris Exhibition of 1900. The proprietor is the lessee of the restaurant of the Kurhaus, Wiesbaden, where his own wines are kept, and supplies the same also at the restaurant "Tiroler Alpen" at the St. Louis Exhibition.

3321 **Otto & Aug. Schmidt** * Kreuznach, Rheinland * Export of German wines to all parts of the world.

3322 **Scholl & Hillebrand, Vine growers** * Rüdesheim a. Rh. * Rhine and Moselle wines. Export to all countries. Awards Paris exhibition 1900, gold medal; Düsseldorf Industrial Exhibition, gold medal.

3323 **Freiherrlich von Schorlemersche Rentelverwaltung** * Trier a. d. Mosel * Zeltinger of 1893, Lieser-Niederberger of 1899, and Brauneberger of 1900.

3324 von Schubert * Grünhaus b. Trier * Vine grower. Three varieties of white wine.

3325 H. Sichel Söhne * Mainz a. Rh. * Vine grower and wine dealer. Four varieties of white wine.

3326 Carl Sittmann * Oppenheim a. Rh. * Vine grower. "Dienheimer Guldenmorgen Riesling" of 1900, "Oppenheimer Sackträger" of 1900, and choice "Oppenheimer Kreuz Riesling" of 1900 of own growth.

3327 Soehnlein & Co., Rheingauer Schaumweinkellerei, A.-G. * Schierstein a. Rh. * Established 1865. Speciality: "Rheingold" sparkling wine. Export to all countries.

3328 S. Strauss Söhne, Rhenish Export Cellars * Frankfurt a. M. * Speciality: Rhine wines of own growth, "Scharlachberger," "Kempter Berg," and "Laubenheimer Platte."

3329 Trarbach Nachf. * Berlin 56 * Established 1847. Vine grower and wholesale wine dealer. Specialities: Saar, Moselle, and Rhine wines. Army contractor. Widest market in the trade.

3330 P. W. Franz Valckenberg, wholesale wine dealer, and vine grower * Worms a. Rh. * Rhine wines; "Liebfraumilch" of 1897, choice "Liebfraumilch" of 1897, "Liebfraumilch Kirchenschlüssel" of 1901 (registered trade marks).

See advertisements p. 23.

3331 Gustav Vanvolxem * Trier a. d. Mosel * Vine grower. "Caseler Riesling" of 1895, and 1897, "Oberemmeler Riesling" of 1900.

3332 Gebrüder Wagemann * Wiesbaden * Wine dealer. Purveyor of the Grand-Ducal Court of Baden. Branches in London and New York. Two medals Paris 1900. General agent for the United States, Alfred de Montebello & Co., 127, Broad Street, New York.

3333 J. L. Wolfs Erben (Weingutsbesitzer Alfred und Otto Wolf) * Wachenheim (Rheinpfalz) * Proprietors of finest vineyards in Wachenheim, Forst, Deidesheim, and Ruppertsberg.

3334 Otto Werren * Kreuznach a. d. Nahe * Wine dealer. Six varieties of white wine.

B. Brandies.

3335 Albert Buchholz * Grünberg i. Schl. * Branch businesses in Cologne, Munich, Leipzig, Worms, and Bingen, own distillery at Krems a. Donau. The firm has grown to be the largest brandy distillery in the German Empire. Its products have already won distinctions at exhibitions, among others at the World's Fair, Chicago, in 1893. See grp. 93 p. 486.

3336 E. F. Elmendorf * Isselhorst i. Westfalen * Corn brandy distillery, malt house, and yeast manufactory. Established 1689. 1. Old Corn brandy (German Whiskey) "Elmendörfer" brand. 2. Best double gin, distelled from corn, "Steinhäger" brand. Yearly export 1,000,000 litres. German army and navy supplied. Many high class awards, among others, Chicago 1893, Paris 1900, and the only gold medal for spirits at Düsseldorf 1902.

3337 J. A. Gilka * Berlin SW., Schützenstr. 9 * Manufacturer of the world-famous "Gilka," or Berlin absinthe. Established 1836. Purveyor to the courts of T. M. the German Emperor and the Emperor of Austria-Hungary, T. R. H. Prince Friedrich Karl of Prussia, Prince Friedrich Leopold of Prussia, the Grand Duke of Hessen u. bei Rhein. Awards and highest honours at all international exhibitions, among others, gold medal Moscow, gold medal Exposition Universelle de Paris, and the State Prize of the Kingdom of Prussia. General agent for the whole of the United States of America, Wm. G. Moehring & Co., 151/153, Cedar Street, New York.

3338 H. C. König * Steinhagen i. Westfalen * "Steinhäger" distillery. Genuine Steinhäger of the "Steinhäger Urquell" brand. 100 medals. Sample cases of a dozen jugs to be had from Harder & de Voss of Hamburg. Sold by the glass.

3339 Georg Scherer & Co. * Langen near Frankfurt a. M. * See grps. 93 and 94 p. 487 and 488.

3340 Whiskybrennerei von Julius Lappe. Court purveyor to H. R. H. the duke of Saxe-Coburg-Gotha * Neudietendorf in Thüringen * Four leafed clover whiskey, pure fermented liquor made of malted native grain. Award at the Exposition Universelle de Paris 1900. See grp. 93 p. 487.

Group 93.

Syrups and Liqueurs—Distilled Spirits—Commercial Alcohol.

3341 Albert Buchholz, Kognakbrennerei * Grünberg i. Schl. * Orange Brandy, Egg brandy, and "Kirschwasser." See grp. 92 p. 486.

3342 Landauer & Macholl * Heilbronn * Established 1860. "Kirschwasser"

distillery "Zwetschgenwasser", and Bilberryspirits. Cherry brandy. Awards, Philadelphia Exhibition 1876, gold medal Frankfort a. M. 1900, gold medal Paris 1900. Export to all countries.
See advertisements p. 22.

3343 **Th. Lappe** * Neudietendorf i. Th. * Proprietor: J. Lappe, dispenser. Court purveyor to H. R. H. the Duke of Saxe-Coburg-Gotha. 1. Th. Lappe's aromatic, choice bitters, prepared since 1828 in the dispensary of Th. Lappe, and his successors, the owners of the dispensary and proprietors of the firm Th. Lappe, Neudietendorf. Favorable opinions by municipal teeting office, Gotha, and by several prominent physicians, on its effect on the digestive organs. Gold medal at the Merseburg exhibition of 1865, and also various other distinctions at German exhibitions. Foreign awards, International Exhibition Sydney 1879, Porto Alegre 1881, Amsterdam 1883, Antwerp 1885, World's Fair Chicago 1893 and Paris 1900. Export to all parts of the world, principally to the United States of North America. Sole agents, Bätjer & Co., New York. 2. "Thüringer Bergtau" (Thuringian mountains dew) finest table liqueur. Awarded Paris 1900.

3344 **Isidor Mamlok** * Breslau * Distillery of fine liqueurs. Established 1877. Specialities, adapted for export, and to be obtained at the Bar, Curaçao, Breslau Corn Brandy, Allasch, Alter Dessauer. Enquiries invited.

3345 **Carl Mampe** * Berlin N., Veteranenstrasse 24 * Established at Köslin in 1853, continued in Berlin 1879. Specialities: "Dr. Mampe's Bitters," prepared from the secret recipe of Geh. Sanitätsrat Dr. Karl Mampe, "Half and Half," "Mampe and pomegranate." Yearly 3/4 million bottles consumed in Berlin. Awards at most exhibitions, among others the Royal Prussian State Medal.

3346 **Bommerlunder-Fabrik** * Flensburg * Established 1760. Speciality: Bommerlunder table aquavitæ, distilled from corn. Many awards. Agents: Hans Jensen, Chicago, Henry Kröger & Co., New York.

3347 **Georg Scherer & Co.** * Langen near Frankfurt a. Main * Cognacs, liqueurs. See grps. 92 and 94 p. 486 and 488.



3348 **H. Underberg-Albrecht** * Rheinberg am Niederrhein * Inventor and distiller of "Underberg-Boonekamp," motto: Semper idem. Purveyor to H. M. the Emperor William II., &c. Established 1846. Export to all parts of the Globe. Sole agents for North America and Canada: Luyties Brothers, New York. Awards at 25 world fairs and industry exhibitions.

3349 **Whiskybrennerei von Julius Lappe** * Neudietendorf i. Th. * "Vierkleeblatt"-Whisky. See grp. 92 p. 486.

Group 94.

Fermented Beverages.

3350 **Aktienbrauerei zum Löwenbräu** * München * Largest brewery in Germany. Annual sale 630,000 hl. Dark and light export beer. Fancy beers. Tropic proof bottled beers. Export to all parts of the Globe in casks and bottles. Preserved tropic proof seed yeast. Works: 10 Steam engines with 1,400 H.P. 16 Steam boilers with 1,400 q. m. heating area. 5 Double boiling works for 2,500 hl of daily fabrication of beer. Special malt works for an annual production of 300,000 ewt. of malt. Hands employed at average of 800. 143 special railcars. Awarded with first prizes only at all expositions exhibited at. Agents for North America: Beer in barrels: The A. H. Meyer Co., Hoboken

Löwenbräu MÜNCHEN
Registered Trade marke.

N. Y. For beer, filled in bottles at the bewery: Jul. Wile Sons & Co., New York, 148, Douane Street. General agent for Trans Oceanic export: Ebert & Weissflog, Hamburg, 2, Alster glacis.

3351 Bürgerliches Brauhaus München (Münchener Bürgerbräu) * Wide spread export. Highest awards: Chicago 1893. Paris 1900: Grand Prix.

3352 Kulmbacher Exportbrauerei "Mönchshof," Aktiengesellschaft * Kulmbach * Beer.

3353 G. Pschorr * München * Beer.

3354 Gebrüder Freyeisen, By special appointment to H. R. H. the Grand Duke of Baden * Frankfurt a. M. * Founded 1817. Cider and champagne cider. Awarded Chicago; Paris silver medal. Holder of the Royal Pruss. Staatsmedaille and more than 50 other high and highest awards.

3355 Georg Scherer & Co. * Langen b. Frankfurt a. M. * Cider. See grps. 92 and 93 p. 486 and 487.

3356 Gabriel Sedlmayr, Brauerei zum Spaten * München * Highest awards at all expositions where exhibited. Important export to all parts of the globe. See advertisements p. 23.

3357 Jos. Sedlmayr, Brauerei zum Franziskanerkeller (Leistbräu) * München * Entire production in Lager-, Märzen, light Lager and Bockbeer: 360,000 hl. Export to all countries. 450 hands. Highest awards at numerous exhibitions.

Stadtbrauerei Blankenhain in Thüringen, Akt.-Ges. * Speciality: "Malz-Kraft-Beer," sterillsed according to Pasteur. See advertisements p. 20. 3358

Vereinigte Eisenacher Brauereien, Petersberger- und Schlossbrauerei, Akt.-Ges. * Eisenach I. Th. * Spec "Wartburg-Bräu," export beer, sterillsed according to Pasteur, Bavar. and Pilsen receipt. 3359



Trade Mark.

Group 95.

Inedible agricultural products.

Bernh. Bing * Nürnberg * Hops. 3360

S. B. Bing Söhne * Nürnberg * Hops. 3361

Paul Reinemann * Nürnberg * Hops. 3362

Anton Sahlmann * Fürth * Hops. 3363

Ed. Scharren & Co. * Cannstadt * Hops. 3364

M. Seidenberger Söhne * Nürnberg * Hops. 3365

Stein & Köster * Mainz * Hops. 3366

Nahrungsmittel-Untersuchungslaboratorium, Kaiserl. Gesundheitsamt Berlin. See Social economy p. 494. 3367

d) Exhibit of the German East African Protectorate.

Groups 16 to 18, 81, 83 to 85, 90, 95, 96, 113, 114, 116, 120, 121, 123, 127 and 128.

3370 Kaiserl. Gouvernement Daressalam * Books, agricultural products, especially hemp, cotton, coffee, pod fruit, oil producing plants, timber, rubber, useful minerals, shooting and fishing products, ivory, ethnological objects, caravan equipment.

3371 Bergbaufeld Luisenfeld, G. m. b. H. * Berlin SW. 48., Wilhelmstr. 29 * See grp. 116 p. 493.

3372 Hansing & Co. * Hamburg * Vanilla from the Kilopeni plantation. See grp. 90 p. 489.

3373 A. Krüss, Optisches Institut * Hamburg, Adolfsbrücke 7 * See grp. 16 p. 411.

Prof. Wilhelm Kuhnert * Berlin, Luitpoldstrasse 41 * Original paintings and sketches from German East Africa: Palla-antilopes, elephants, gnoos hyena-dogs, water buck, elands, lions, grant gazels, vulture galeany, baboons, zebras, horse antilopes. See p. 393. 3374

Kolonialwirtschaftliches Komitee * Berlin, Unter den Linden 40 * Maps and publications concerning Colonial economy. 3375

Justus Perthes * Gotha * Map of the German East African Protectorate. See p. 384 and grp. 18 p. 411. 3376

3377 Dietrich Reimer (Ernst Vohsen) * Berlin SW., Wilhelmstr. 29 * Works and maps on German East Africa. See grps. 17 and 18 p. 410 and 411.

3378 C. G. Schillings * Gürzenich-Düren * See grp. 16 p. 411.

v. Tippelskirch & Co. * Berlin * See grp. 120 p. 490. 3379

Dr. Heinrich Traun & Söhne, vorm. Harburger Gummikamm-Co. * Hamburg * Objects made of East African galvanized rubber. 3380

2. Single Groups.

Group 83.

Theory of Agriculture. Agricultural Statistics.

See grp. 5 p. 478.

Joint Exhibition of Objects of Outfit, Apparatuses and Utensils for the Chemical Laboratory of an Agricultural Experimenting Station.

Managers: Dr. Salomon and Dr. Sauer, Berlin N., Chausseestr. 3.

3381 Vereinigte Fabriken für Laboratoriumsbedarf, Ges. m. b. H. * Berlin N., Chausseestrasse 3 * Founded by the following firms: Max Kaehler & Martini and Dr. Peters & Rost. Sole agency in U. S. A. and Canada: Laboratory and School Supply Co. Ltd., New York. See grps. 19, 23 and 140 p. 365 to 368, 371 to 373, 425, 426 and 498.

3382 Agrikulturchemische Versuchsstation der Landwirtschaftskammer für die Provinz Brandenburg * Dahme (Mark) * Three small volumes of publications and four photographic reproductions.

3383 Kgl. Sächsische Landwirtschaftliche Versuchsstation zu Möckern, in Gemeinschaft mit Franz Hugershoff * Leipsic * Model of a Pettenkofer respiration apparatus. Calorimeter and shell, system Langbein-Hugershoff.

3384 Kgl. Landwirtschaftl. Hochschule zu Berlin (Prof. Zuntz) * Respiration apparatus.

3385 Landwirtschaftliche Versuchsstation Hildesheim * Rotating apparatus for determining phosphoric acid solvent in citric acid, in Thomas meals, system Prof. Dr. Karl Müller.

3386 Landwirtschaftliche Versuchsstation der Landwirtschaftskammer für den Regierungsbezirk Kassel * Marburg a. Lahn * Precision adjusting balance, barometer, toluol bath, &c.

Dr. Th. Omeis, Direktor der landwirtschaftlichen Versuchsstation * Würzburg * Filtering stands for analytical laboratories, special construction; Nitrogen decomposing stand, special construction. 3387

Tierphysiolog. Institut d. landwirtschaftl. Akademie * Bonn-Poppelsdorf * Dir. Prof. Dr. Oskar Hagemann, four reproductions concerning the respiration calorimeter of the Institute and the calorimeter house. 3388

Group 89.

Preserved Meat, Fish, Vegetables and Fruit.

Carl Bödiker & Co., Internationale Schiffsbedarf-Gesellschaft, Bremen * Bremerhaven, Geestemünde, Tientsin, Tsingtau, Swakopmund * Speciality: Equipments of expeditions, ships, troops. See grp. 8 p. 389. 3389

Group 90.

Sugar and Confectionery-Condiments and Relishes.

Hansing & Co. * Hamburg * Vanilla from the plantation Kilopeni. 3390

Group 97.

Horses.

See special catalogue.

1. Verband der Pferdezüchter in den Holsteinischen Marschen, e. G. m. b. H., (Sektion der Landwirtschaftskammer für die Provinz Schleswig-Holstein) Sommerlander Riep. 3391

2. Verband der Züchter des Oldenburger eleganten schweren Kutschpferdes * Rodenkirchen i. Oldenburg. 3392

3. Landwirtschaftlicher Hauptverein für Ostfriesland * Norden * The studbook of Ostfriesland. 3393

Departments K and M.
Forestry, Fishery and Game.
(Forestry, Fishery and Game Building.)

Joint Exhibition of the Royal Prussian Fiscal Forestry Management.

Manager: Oberforstmeister Riebel, Eberswalde.
Artistic arrangement: Arthur Schulz, sculptor, Berlin.

Groups 112, 113, 120 and 121.

3403 **Kgl. Preuss. Staatsforstverwaltung** * Particulars in special catalogue.

3404 **Aktiengesellschaft H. F. Eckert** * Berlin-Friedrichsberg * Branch at Bromberg. Factory of agricultural machines. Ploughs for forest culture; plough models.

3405 **Otto Bock, Purveyor to H. M. the Emperor and King** * Berlin W., Kronenstr. 7 * Antlers (Guns, taxidermy, hunting, &c., requirements.

3406 **Friedrich Brüggemann** * Hannover * Objects of exhibition. See grp. 74 p. 474.

3407 **F. Duensing, Maschinenfabrik** * Fürstenwalde (Spree) * Plough wheel for preparing soil for pines, constructed by the Royal Pruss. Forester Spitzenberg.

3408 **J. C. Hartung** * Mühlhausen i. Th. * Inventor and manufacturer of the cross steel hand borer, the deep soil and cartridge borer. German, Engl. and American Patent.

3409 **Haynauer Raubtierfallenfabrik E. Grell & Co.** * Haynau i. Schl. * Traps for wild beasts and birds, throwing machines for clay pigeons; animals.

3410 **M. Hensoldt & Söhne** * Wetzlar * Prism telescope, prism aiming telescopes, distance measures, terrestrial telescopes. Single parts of optical instruments.

3411 **P. W. Hermans** * Prummern, Rheinland * Schreiner. Beetle traps for destroying harmful insects on pasture ground.

3412 **Nicol. Kissling** * Vegesack b. Bremen * China plates for use in gardening, agriculture and forestry.

3413 **Kgl. Preuss. Forstakademie Eberswalde** * Scientific works. Reproductions from forestry instruction and forestry work. Particulars in special catalogue.

3414 **Kgl. Preuss. Forstakademie Münden** * Reproductions from forestry instruction and forestry work. Particulars in special catalogue.

3415 **Patronenhülsenfabrik Bischweiler. Walbinger, Meuschel & Co.** * Bischweiler im Elsass * Manufacture of shooting and revolver cartridges, Flobert Munition and gun wads. See advertisements p. 7.

3416 **Pommersche Eisengiesserei u. Maschinenfabrik** * Stralsund * Drilling machine for forest culture, system Spitzenberg.

3417 **Remscheider Sägen- u. Werkzeugfabrik J. D. Dominicus & Söhne** * Remscheid-Vieringhausen * Saws and tools for forestry.

3418 **Wilhelm Spoerhase, vorm. C. Staudinger & Co.** * Giessen * Factory for Precision balances and weights, forest measuring instruments. See p. 374 and gr. 19 p. 415.

3419 **v. Tippelskirch & Co.** * Berlin * Outfitters for the Tropics (special factory). Agencies at Swakopmund (German South West Africa) and Tsingtau (German China). Purveyors to the Imperial Foreign Office, the headquarters of the Imperial Colonial troops and central committee of the German Red Cross. See Agriculture p. 489.

3420 **R. Weber, Raubtierfallenfabrik** * Haynau i. Schl. * Swan throat, flat, traps, vulture irons, spring-gun, slings, trap models, stuffed animals, game-call.

Single Exhibitors.
Group 121.
Products of Hunting.

3421 **Carl Hagenbeck, Tierpark** * Stellingen near Hamburg * Purveyor of animals of all kinds for Zoolog. Gardens, parks, &c. Animals paradise, North pole panorama, Zoological Circus on the Pike.

Department L.
Mines and Metallurgy.
(Palace of Mines and Metallurgy.)

1. Joint Exhibitions
embracing several groups.
Exhibit of the Kgl. Preussisches Ministerium für Handel und Gewerbe.
Groups 115, 117, 119, 136, 138 and 139.

Group 115.

Working of Mines, Ore Beds and stone quarries.

3431 Kgl. Preuss. Bergwerksdirektion in Saarbrücken * 6 drawings of the new mining school building at St. Johann-Saarbrücken. See grps. 136, 138 and 139 p. 492 and 493.

3432 Kgl. Preuss. Geolog. Landesanstalt und Bergakademie * Berlin N. 4, Invalidenstr. 44 * Arrangements and methods of promoting mining.

3433 Erlemann & Wolf * Zwickau i. S. * Machines and safety mining lamps. Awarded 2 State, 4 gold, 10 silver and bronze medals, and 4 diplomas of honour, at the Worlds Fair 1900 the first prize for safety mining lamps, "gold medal." Besides, Herr Carl Wolf sen. received for his improvements in safety lamps the Rote Adlerorden 4. Klasse from H. J. M. Kaiser Wilhelm II. and the Ritterkreuz des Albrechtordens from H. M. King Albert of Saxony. The firm was established in 1863. Branches: Waldenburg (Silesia) and Liége (Belgium). 2 steam engines with 40 H.P. each and 3 dynamos with 14 resp. 3 H.P. are at work. In 1903 there were 425 hands besides 36 officials. The annual output is about 60,000 safety mining lamps. Export to all parts of the globe. Exhibits: a collection of Wolf safety mining lamps and other systems of safety lamps with the necessary spare gear and tools, furthermore machines and apparatuses for keeping the lamps in order.

Drägerwerk Lübeck * Fabrication of oxygen for inhaling, live saving of the aphixiated, breathing in poisonous air. Narcotising apparatus. 3434

Group 117.

Mines, models, maps, photographs.

Bergwerksgesellschaft Hibernia * Herne (Westfalen) * Model of surface plant at Shamrock colliery, pits III and IV. Photograph stand and photographs. 3435

Gelsenkirchener Bergwerks-Aktien-Gesellschaft * Gelsenkirchen * Photographs of colliery buildings and surface plants. 3436

Grossherzoglich Badische Geologische Landesanstalt * Heidelberg * Geological maps with explanations and publications of the Geologischen Landesanstalt, in 6 volumes. 3437

Kgl. Preuss. Geolog. Landesanstalt und Bergakademie * Berlin * Geological maps with explanations, essays, annuals, reliefs and teaching appliances. 3438

Kgl. Preuss. Oberbergamt in Breslau * Maps and wall charts of the northern part of the upper Silesia coal districts. 3439

Verein für bergbauliche Interessen im Oberbergamtsbezirk Dortmund * Essen on Ruhr * 4 Oil-paintings. 3440

Westfälische Berggewerkschaftskasse * Bochum * Mining aid funds, mainte- 3441

nance of mining schools and mining preparatory schools laboratories, fire damp experimental station, boundry marking, publication of maps, station for testing ropes, dito for testing anemometers, geological Investigation of coal mountains, building of canals and hospitals. Model of the lower Rhine and Westphalian (Ruhr) coal district in a ground plan and 38 sections painted on glass, scale 1 : 10,000.

Group 119.

Literature of Mining, Metallurgy, &c.

3442 Grossh. Badische Geologische Landesanstalt * Heidelberg * Geological maps with explanations and publications of the Geologische Landesanstalt. See grp. 117 p. 491.

3443 Kgl. Preuss. Geolog. Landesanstalt und Bergakademie * Berlin * Geological maps with explanations, essays, annuals, reliefs and boring tools. See grp. 117 p. 491.

3444 Kgl. Sächs. Bergakademie * Freiberg (Sachsen) * 200 printed copies of a essay on Saxony's mining and metallurgy. See p. 364.

3445 Verein für die bergbaulichen Interessen, Sitz Essen a. Ruhr * Established 1858. Comprising as members 103 mines with an output of about 64 million tons annually. About 260,000 men. Exhibit: various new publications. See grp. 117 p. 491.

Group 135.

Provident Institutions.

3446 Allgemeiner Knappschafts-Verein * Bochum * Intended to aid the members and their families. Its developement and aim in graphic and numerical representation. Consumption sanatorium at Beringhausen. See grp. 139 p. 493.

3447 Saarbrücker Knappschaftsverein, Kranken- und Pensionskasse * Graphic representation of chief results from 1860 to 1902 Incl. on 4 tables.

Group 136.

Housing of the working classes.

3448 Bochumer Verein * Bochum * Drawings, photographs and models of workmen's dwellings. See p. 361 and grp. 118 p. 494.

3449 Gelsenkirchner Bergwerks-Aktiengesellschaft * Gelsenkirchen * Models of workmen's colony. See grp. 117 and 138 p. 491 and 492.

3450 Kgl. Preuss. Berginspektion * Stassfurt * Four photographic representations of workmen's colony near the Berlepsch mine.

3451 Kgl. Preuss. Bergwerksdirektion * Saarbrücken * Workmen's provident institutions at the fiscal coal mines near the Saar river. See grps 115, 138 and 139 p. 491–493.

Group 138.

General Betterment Movements.

3452 Fürstliche Bergwerksdirektion * Waldenburg (Schlesien) * Pamphlet. Social welfare institutions of the Fürstenstein mines. Proprietor: H. H. Prince of Pless.

3453 Gelsenkirchener Bergwerksaktiengesellschaft * Gelsenkirchen * Drawing of social welfare building of the united Stein and Hardenberg collery. See grp. 117 and 136 p. 491 and 492.

3454 Oberschlesischer Knappschaftsverein * Tarnowitz * 4 pictures of hospitals of the Oberschlesische Knappschaftsverein. See gr. 139 p. 493.

3455 Bergbaugesellschaft "Neu-Essen" * Essen (Ruhr) * Architectural drawing of a gang's cabin near the Fritz plt, built in 1901.

3456 Göhmann & Einhorn, G.m.b.H. * Brüssel, Kattowitz, Dresden, Dortmund * Drawings of washing sheds and bathing places for colleries and factories.

3457 Kgl. Preuss. Bergwerksdirektion * Saarbrücken * Memorandum on the Social welfare institutions for the benefit of the workmen in the district of the Royal Mining Direction Saarbrücken. Benevolent Institutions, shewn on the seam map. See grp. 115, 136 and 139 p. 491–493.

3458 Kgl. Preuss. Oberbergamt * Breslau * Workmen's benevolent institutions in the Upper Silesia industry district. Album with heliographic illustrations. See grp. 117 p. 491.

3459 Friedrich Krupp, Aktiengesellschaft * Essen a. Ruhr * Social welfare institutions.

3460 Oberschlesischer Berg- und Hüttenmännischer Verein * Kattowitz * Workmen's benevolent institutions in the Upper Silesia industry district. Album with heliographic illustrations.

3461 Verein zur Förderung des Wohls der arbeitenden Klassen im Kreise Waldenburg i. Schlesien, eingetragener Verein * Waldenburg, Silesia * Festal report of the celebration of the 25 year of the union's existence.

Group 139.

Charities and Correction.

3462 Allgemeiner Knappschaftsverein * Bochum * Coloured perspective views of consumption sanatorium at Beringhausen near Meschede. See grp. 135 p. 492.

2. Single Groups.

Group 115.

Working of Mines, Ore beds and stone quarries.

3465 Kgl. Porzellan-Manufaktur * Berlin * Apparatuses for chemical and technical use. See grp. 45 p. 464.

Group 116.

Minerals and stones, and their utilisation.

3466 Aktiengesellschaft Norddeutsche Steingutfabrik * Grohn-Vegesack near Bremen * Glazed earthenware tiles. See grp. 45 p. 463.

3467 Gustav Bähr, Baumeister * Charlottenburg, Bleibtreustr. 54 * Tile press for making smooth and ornamental tiles and corners. See grp. 45 p. 463.

3468 Bergbaufeld, Luisenfeld, G. m. b. H. * Berlin, Wilhelmstr. 29 * Jewelry, uncut and cut garnets from Luisenfelde, Lindi Hinterland, German East Africa. See Agricultural Building p. 488.

3468a Amber Exhibition * See Art Industry Palace p. 431.

3469 Cordes & Co. * Hannover, Deutschland * Corde's "Leichtstein" German patent No. 134,948. American, Canadian and 16 foreign patents. German Architecture Exhibition. Prize of honour of the town of Dresden. Hannover 1903: First prize, Gold medal. 64 licensed factories in Germany with annual output of over 30 millions. Corde's "Leichtstein" is exceptionally light, amazingly hard, absolutely fireproof, sound diminishing, proved to be a good isolater and very cheap. Patent for sale. See grp. 25 p. 427.

3470 Mathildenhütte, Flusspatverkaufsverein * Harzburg * Fluorite for chemical purposes, glass factories, iron foundries, enamelling and steel works and cement factories.

3471 Neue Tonwerke, Aug. Gundlach & Co. * Grossalmerode * Various sorts of clay for glass crucible purposes.

3472 M. Perkiewicz, Tonwerke Ludwigsberg bei Moschin * Table of natural products representing by illustrations and text "Perkiewicz's Process." The production of pure burned colours or kiln wares without the use of colours or Engobe colouring clays. Is employed even after the ten times more costly baryte process (addition of carbonate of baryte) has failed. Theoretically and practically tested. Perfect solution of this hitherts undecided question in ceramics. German patent 130,413. German patent applied for. American patent 740,040. Patented in all civilised countries. Own works. Annual output 14 million pieces of claywork. Mining Building. See grp. 45 p. 465.

See advertisements p. 16.

3473 Tonwerk Schippach bei Klingenberg a. Main (Bayern) * Export of fine clays for crucibles and smelting pots. Clays for metallurgy and crucibles.

3474 Joh. Ph. Wild * Idar * Heart shaped Brazilian Topas, facetted at the bottom and ground convex at the top. (Art Industry Palace.)

3475 J. Zinndorf * Baumbach (Westerwald) * Self made dressed stones, whet stones and grindstones.

Exhibition of Watering Places.
(Liberal Arts Building.)

3476 Königlich Preussische Domänenverwaltung * Berlin * Baths and Mineral springs. Ems: Carbonic acid alcalic thermes: Kränchen, Kaiser, Kassel and Viktoria springs. Drinking cure, carbonic acid thermal mineral baths, inhalatoria (Levin, Schnitzler, Bulling). Gurgling apparatuses, loxenges, spring salts. Langenschwalbach, earth alcalic iron acidulous waters, drinking and bathing cure, new carbonic acid bath. Schlangenbad: "Wildbad" Thermal drinking and bathing springs. Nenndorf: Brine and sulphur springs. Drinking and bathing cure, central and separate inhalation. New sulphur mud bath. Norderney: German Ocean Island watering place, cold and warm sea baths, central water works, flushing canalisation.

3463 Kgl. Preuss. Bergwerksdirektion * Saarbrücken * Building plans of hospital for miners at Holz. See grps. 115, 136 and 138 p. 491 and 492.

3464 Oberschlesischer Knappschaftsverein * Tarnowitz * 4 views of hospitals of the Oberschlesische Knappschaftsvereins. See grp. 138 p. 492.

3477 Ministerium des Innern * Karlsruhe * Management of the Grand Ducal Watering place of Baden-Baden and Badenweiler. Diorama of Baden-Baden. Hot Springs 63·9° C.

3478 Bad-Nauheim * Grossh. Hess. Staatsbad. Near Frankfort-on-the-Maine. Three warm carbonic acid brine springs, 7 bath houses, 277 seperate bath cells. 1903: 23,931 patients, 331,027 baths for heart ailments, gout, rheumatism, diseases of the nerves and women's ailments.

3479 Kais. Gesundheitsamt * Berlin * Wall diagram and pamphlet concerning German sanatory springs and baths.

Natural Mineral Waters.
(Agriculture Building.)

3480 Aktiengesellschaft Apollinarisbrunnen * Neuenahr * Apollinaris, effervescent alkaline mineral water bottled at the Appollinaris Spring at Neuenahr, Rhenish Prussia, Germany. The exhibitors are the owners of the Spring. Sole exporters are the Apollinaris Co. Lmtd., 4, Stratford Place. Oxford Street, London W. Agents: The United Agency Co., 503, Fifth Ave. New York. The Appollinaris Spring was discovered in 1851 in consequence of the exhalations of carbonic acid in the neighbourhood. Appollinaris has long commended itself to the medical profession and to the public. The annual sale of this water which amounted in 1873 to one million and eighteen million bottles in 1893 has now increased to thirty million bottles and jugs.

3481 Bad Bertrich * Mineral waters.

3482 Rosbacher natürliches Mineraltafelwasser * Springs near Homburg * High award Chicago 1893; Diploma London 1902. Chief Office: Rosbach Wharf, Waterloo Bridge, London. New York: 126 Bleecker Street. Best mineral water for all ailments. Please visit our stand.

3483 Fürstlich Wildunger Mineralquellen, A.-G. * Wildungen * Mineral water from the Helenen and Georg-Viktor springs in bottles.

Group 118.
Metallurgy.

3484 Bochumer Verein für Bergbau und Gusstahlfabrikation * Bochum * Chime of cast steel Bells in the German State Building. See p. 361 and grp. 136 p. 492.

3485 Aug. Gundlach * Grossalmerode * Manufacture of graphite melting crucibles of every shape and size for melting gold, silver, brass, copper, German silver, bronze, nickel, iron, steel, &c. New process for firing the above at high temperatures thereby increasing their durability.

3486 Alfred Gutmann, Aktiengesellschaft für Maschinenbau * Ottensen-Hamburg * Rotary blast No. 8. Gas suctions machine No. 4. Various moulds and drawings. See grps. 62, 64 and 65 p. 469 and 471.

See advertisements p. 12.

Group 119.
Literature of mining, metallurgy, &c.

3487 Müller & Schmidt * Coburg * Publishing Office of the "Sprechsaal," Journal for Ceramic, glass and allied industries. Official organ of the most important unions of the ceramic and glass industry in Germany and Austria-Hungary. Established 1868. Gold medals Brussels 1888. 12 selected years.

Department O.
Social Economy.
Education Building. Model City.

1. Joint Exhibition,
comprising several groups.
a) German Hygiene Exhibition.

Management: Kaiserliches Gesundheitsamt, Berlin NW., Klopstockstr. 18.
Artistic Arrangement: Architekt Bruno Möhring, Berlin.
(See separate Catalogue of the Hygiene Exhibition as well as the Joint Exhibition for the combating of diseases.)

Group 1.
Elementary Education.
See Education p. 381.

Group 19.
Instruments of Precision, physical apparatus, &c.—Coins and medals.
See Liberal Arts p. 412.

Group 20.
Medicine and Surgery.
See Liberal Arts p. 416.

Group 23.
Chemical and Pharmaceutical Arts.
See Liberal Arts p. 417.

Group 26.
Models, plans and designs for public works.
See Liberal Arts p. 427.

Group 71.
Various applications of Electricity.
See Electricity p. 472.

Group 83.
Theory of Agriculture—Agricultural Statistics.
See Agriculture p. 476.

Group 116.
Minerals and stones, and their utilization.

3493 Bäder-Ausstellung. See p. 493.

Group 136.
Housing of the working classes.

3494 Bürgermeisteramt der Hauptstadt Mannheim * Building plan of zones.

3495 Statistisches Amt der Stadt Dresden * Representation of a comparison of the housing conditions in various towns.

Group 137.
The Liquor Question.

3496 Kais. Gesundheitsamt * Berlin * Publication concerning alcohol. Published by Julius Springer, Berlin N.

Group 139.
Charities and Correction.

Kaiserliches Gesundheitsamt * Berlin * Map of the German Sanatoria for consumption. 3498

Barmer Verein für Gemeinwohl * a) Sanatorium for anemic and chlorosic persons at Godesberg. b) Removal of sick and convalescent. 3499

Magistrat der Haupt- und Residenzstadt Berlin * Perspective representation of the Rudolf Virchow Hospital. 3500

Rat der Stadt Leipzig * Model and plans of the Dösen Sanatorium. Orphanage. 3501

The German Hospitals for Consumptives, in connection with the Kais. Gesundheitsamt.

A. Public Hospitals for Consumptives.

Kreis Altena I. W. * Plans of the National Hospital for the District of Altena, Lüdenscheid i. W. 3502

Badische Anilin- und Sodafabrik * Ludwigshafen a. Rh. * Plans of the Dannenfels Sanatorium near Kirchheimbolanden. 3503

Bergische Volksheilstätten für heilbare Lungenkranke, G. m. b. H. * Plans of the Berg Sanatorium for the People, Ronsdorf. 3504

Magistrat der Königlichen Haupt- und Residenzstadt Berlin * Plans of the Home for Consumptive men, Buch. 3505

Berlin-Brandenburger Heilstättenverein * Plans of the Belzig Sanatorium. 3506

Cölner Heilstättenverein * Plans of the Cologne Town Hospital "Auguste-Victoria," Sanatorium for the People, Rosbach a. d. Sieg. 3507

Deutsche Heilstätte in Davos bei Wolfgang in Graubünden (Schweiz) * Plans of the Sanatorium. 3508

Frankfurter Rekonvaleszentenverein * Plans of the Ruppertshain Sanatorium. Ruppertshain in the Taunus, Mountains. 3509

Stadtmagistrat Fürth * Plans of the Fürth Sanatorium. 3510

Heilstättenverein für den Regierungsbezirk Minden * Plans of Auguste-Victoria Institution. Public Sanatoria 1 and 2 for Lippspringe. 3511

Heilstättenverein Nürnberg * Plans of the Engelthal Sanatorium near Hersbruck. 3512

3513 Heilstättenverein für Lungenkranke im Regierungsbezirk Oppeln * Plans of the Loslau Public Sanatorium in Upper Silesia.

3514 Invalidenversicherungsanstalt Hessen * Plans of the Ernst Ludwig Sanatorium near Sandbach im Odenwald.

3515 Johanniterorden * Plans of the Johanniter Sanatorium for Consumptives, Sorge, Harz Mountains.

3516 Kuratorium der Heilstätte Edmundsthal * Plans of the Edmundsthal Sanatorium, Geesthacht near Hamburg.

3517 Landesversicherungsanstalt Baden * Plans of the Friedrichsheim Sanatorium.

3518 Landesversicherungsanstalt Brandenburg * Plans of the Men's Convalescent home with Opportunities for work, Hohenelse, near Rheinsberg.

3519 Landesversicherungsanstalt Braunschweig * Plans of Sanatoria Albrechtshaus and Marienheim in the Forest district of Moorthaler near Stiege, Harz Mountains.

3520 Landesversicherungsanstalt der Hansestädte * Lübeck * Plans of the Oderberg and Glückauf Sanatoria near St. Andreasberg, Harz Mountains and the Convalescent Home, Gross-Hansdorf near Hamburg and Westerland on the Island of Sylt, with Pamphlet: "The Co-operation of the National Insurance Institute of the Hanseatic towns in the combating of Consumption with a description of the Institutions erected for this purpose. Sanatoria Convalescent Homes and Homes for the disabled."

3521 Landesversicherungsanstalt Elsass-Lothringen * Plans of the Leopoldinenheim Sanatorium near Altweier.

3522 Landesversicherungsanstalt Posen * Plans of the Crown Prince Wilhelm's Public Sanatorium near Obornik.

3523 Märkischer Volksheilstättenverband * Plans of the Märkische Public Sanatorium, Ambrock near Hagen i. W.

3524 Magdeburger Verein zur Bekämpfung der Lungenschwindsucht * Plans of the Sanatorium for Lung Disease, Lostau.

3525 Stadtgemeinde München * Plans of the Town Sanatorium of Harlaching near Munich.

3526 Nassauischer Heilstättenverein für Lungenkranke * Plans of the Nassau Sanatorium for Consumptives, Naurod.

3527 Norddeutsche Knappschaftspensionskasse in Halle a. S. * Plans of the Miners Sanatorium Sülzhayn, Harz Mountains.

3528 Ortskrankenkasse Stuttgart * Plan of Convalescent Home in Neustädtle.

3529 Patriotisches Institut der Frauenvereine für das Grossherzogtum Sachsen * Plans of Sophia Sanatorium near Berka on the Ilm.

3530 Pensionskasse für die Arbeiter der Preussisch-Hessischen Eisenbahngemeinschaft * Plans of the Stadtwald and Moltkefels Sanatoria.

3531 Provinzialverband der Vaterländischen Frauenvereine der Provinz Sachsen * Plans of the Vogelsang Woman's Sanatorium for Consumptives.

3532 Rathenower Lungenheilstättenverein (E. V.) * Plans of the Rathenow Sanatorium for Consumption.

3533 Kreis Saarbrücken * Plans of the Sonnenberg Sanatorium near Saarbrücken.

3534 Sanitätsverband für München und Umgebung (anerkannter Verein) * Plans of the Oberölkofen Convalescent Home near Grafing, Upper Bavaria.

3535 Thüringische Landesversicherungsanstalt * Plans of the Sanatorium for Consumptive women, Römhild, Thuringia.

3536 Vaterländischer Frauenverein (Sektion VII) zu Kassel * Plans of the Oberkaufungen Sanatorium near Cassel.

3537 Verband zur Errichtung von Volksheilstätten für Lungenkranke im Regierungsbezirk Coblenz * Plans of the Public Sanatorium in Waldbreitbach near Neuwied.

3538 Verein zur Begründung von Volksheilstätten im Königreiche Sachsen * Plans of the Albertsberg and Carolagrün Public Sanatoria near Reiboldsgrün i. V.

3539 Verein zur Gründung eines Sanatoriums für unbemittelte Lungenkranke in Unterfranken * Plans of the "Luitpoldheim" Sanatorium near Lohr, Spessart.

3540 Verein zum Heinrich-Hospital * Plans of the Heinrich's Hospital Arlen.

3541 Verein für Volksheilstätten in Oberbayern * Plans of the Planegg-Krailling Public Sanatorium.

3542 Verein für Volksheilstätten in der Pfalz (E. V.) * Plans of the Public Sanatorium for Consumptive Men Albersweiler.

3543 Verein für Volksheilstätten in Württemberg * Plans of the Public Wilhelmsheim Sanatorium.

3544 Volksheilstättenverein vom Roten Kreuz * Plans of the Red Cross Public Sanatorium, Grabowsee near Oranienburg.

3545 Kreis Wittlich * Plans of the Grünewald Sanatorium for Consumptives near Wittlich.

B. Private Sanatoria for Consumptives.

3546 Aktiengesellschaft Falkenstein in Frankfurt a. M. * Plans of the Falkenstein Sanatorium, Taunus Mountains.

3547 Dr. Friedmanns Erben * Plans of the Blankenhain Sanatorium for Throat and Breast Diseases.

3548 Dr. Hettinger * Plans for the Nordrach Sanatorium for Consumptives in the Black Forest, Baden.

3549 Dr. Kremser * Plans of the Sülzhayn Sanatorium for Consumptives, near Ellrich, Harz Mountains.

3550 Dr. G. Liebe * Plans of the "Waldhof-Elgershausen" Sanatorium for Consumptives, near Wetzlar.

3551 Neue Heilanstalt für Lungenkranke Schömberg, G. m. b. H. * Plans of the New Schömberg Sanatorium for Consumptives (Oberamt Neuenburg).

3552 Sanatorium Wehrawald, G. m. b. H. * Plans of the Wehrawald Sanatorium in the Black Forest, South Baden.

3553 Dr. Sander und Dr. Maier * Plans of the St. Blasien Sanatorium, Black Forest, Baden.

3554 Süddeutsche Heilanstalt für Lungenkranke Schömberg, G. m. b. H. * Plans of the Schömberg South German Sanatorium (Oberamt Neuenburg).

3555 Dr. Weicker * Plans of the Sanatoria for Consumptives Görbersdorf, "Krankenheim" Public Sanatorium and "Marienhaus" Central.

3556 Dr. E. Wolff, Kgl. Hofrat, und Prof. Dr. R. Fleischer * Plans of the Reiboldsgrün Sanatorium for Consumptives, Vogtland.

Group 140.

Public Health.

3557 Kaiserliches Gesundheitsamt * Berlin * a) 4 Paintings of the Kais. Gesundheitsamt, b) Works from the Kais. Gesundheitsamt on Tuberculosis, &c., c) Memorial on the Utility of the Vaccination Law, d) Meat Inspection Law, e) Little Book on Health, f) Reports on Medical Statistics, g) Annuals on the spread of disease among animals in the German Empire, h) Plastic and Graphic illustrations as aids to a Critical judgement of the state of health in the German Empire.

3558 Magistrat der Haupt- und Residenzstadt Berlin * Illustrations of disinfectants. Plan of the Disinfectory. Rules of the Service. Apparatus.

3559 Dr. W. Beukemann * Hamburg * Illustrations of the Town Milk Supply in the German Empire.

3560 Magistrat der Stadt Cöln a. Rh. * Plans of the Shambles and Cattle market. Models of the Slaughter house for pigs, refrigerating house, and the cattle slaughter house.

3561 Rat der Haupt- und Residenzstadt Dresden * Flayers Yard: a) Model, b) Photographs, c) Tables illustrating the process, d) Products.

3562 Rietschel & Henneberg * Berlin-Dresden * Factory for hygienic technical apparatuses. Transportable steriliser for table water.

3563 Julius Springer * Berlin * Publisher and Bookseller. Complete Publications of the Kais. Gesundheitsamt.

3564 Statistisches Amt der Stadt Dresden * Illustrations of the Meat and Milk Supply. Hygienic Statistics and Climatic conditions of German Towns.

3565 Verlag von Wilhelm Ernst & Sohn * Berlin * The Building of the Kais. Gesundheitsamt in Berlin. By J. Hückels. A Print.

3565a Georg Haertel * Breslau, nur Albrechtstr. * Flügge's formaline dihydrate evaporation apparatus for the disinfection of dwellings. Model of the Breslau Hygienic Institute.

3566 Untersuchungslaboratorium für Nahrungsmittel (Landwirtschaftsgebäude), shown by the Kaiserliches Gesundheitsamt Berlin, and the Committee for the German Nahrungsmittelausstellung at St. Louis * Frankfurt a. M. * and the Firm

3567 E. A. Lentz * Berlin N., Gr. Hamburger Str. 2 * Factory for the equipment of Chemical, Pharmaceutical and Bacteriological Laboratoria, Chemical Works and Works for the making of Mineral waters, with the collaboration of the following Exhibitors:

3568 Chemisches Untersuchungsamt des Kgl. Polizeipräsidiums Berlin (Dr. Juckenack) * Instructions and Apparatuses for the control of food by the police.

3569 Hartmann & Braun, Aktiengesellschaft * Frankfurt a. M.-Bockenheim * Apparatuses for electric resistance measurement.

3570 W. C. Heraeus * Hanau a. M. * Founded 1851. Chicago, Medal for Merit; Paris, Grand Prix. See Groups chemistry, me-

chanics and optics. Instruments and apparatus of platina for laboratories for analytical chemistry.

3571 **Prof. Dr. G. von Hüfner** * Tübingen * Spectro-photometer. 1 Original apparatus.

3572 **Keiser & Schmidt** * Berlin N., Johannisstrasse 20 * Founded 1858. Electric measurement instruments, pyrometers after Le Chateller.

3573 **Fritz Köhler, Universitätsmechaniker** * Leipzig * Physico-chemical apparatus and instruments.

3574 **Königliche Porzellanmanufaktur** * Berlin.

3575 **A. Krüss, Optisches Institut** * Hamburg * Proprietor Dr. Hugo Krüss. Universal spectral apparatus for qualitative and quantitative analysis.

3576 **Otto Pressler** * Leipzig * Factory for scientific instruments for physics, chemistry, pharmacy, and microscopical experiments. Speciality: Apparatus for ascertaining molecular weight (molecule scales) after Beckmann and apparatus after Ostwald.

3577 **E. Sartorius** * Göttingen und Rauschenwasser * Factory for scientific precision instruments. Speciality: Scales for scientific technics.

3578 **Franz Schmidt & Haensch, Optisch mechanische Werkstätten** * Berlin S. 42 * Polarisation apparatus after Lippich. Refractometer after Tornoe for analysing beer.

3579 **Schott & Genossen, Glaswerk** * Jena * Manufacture of glasses for scientific and technical purposes. Jena instruments and tubes.

3580 **Vereinigte Fabriken für Laboratoriumsbedarf, Ges. m. b. H.** * Berlin N., Chausseestr. 3 * Retorts and glass apparatus for laboratories.

3581 **Carl Zeiss, Optische Werkstatt** * Jena * Butter refractometer, immersible refractometer, laboratory microscope.

Hand library of the analytical laboratory for food:

3582 **Joh. Ambros. Barth, Verlagsbuchhandlung** * Leipzig * Prior, The chemistry and physiology of beer. Röttger, Primer of the analytical laboratory for food.

3583 **J. F. Bergmann, Verlagsbuchhandlung** * Wiesbaden * Lehmann, Methods of practical hygienics.

3584 **Wilh. Engelmann, Verlagsbuchhandlung** * Leipzig * Ostwald Luther, Physico-chemical measurements. Cohen, Physical chemistry for medical men.

Ferd. Enke, Verlagsbuchhandlung * Stuttgart * Ostertag, Manual on the inspection of meat. 3585

Otto Enslin, Buchhandlung * Berlin NW., Karlstr. 32 * Collection of works on the chemistry of food. 3586

M. Heinsius Nachfolger, Verlagsbuchhandlung * Leipzig * Fleischmann, Text-book on the dairy. 3587

A. Keil, Buchhandlung u. Kommissionsverlag * Plauen i. V. * Journal for public chemistry. 3588

J. U. Kerm, Verlagsbuchhandlung * Breslau * Rosen, Anatomical charts of food. 3589

M. Krayn, Verlagsbuchhandlung * Berlin W. * Zipperer, The manufacture of chocolate. 3590

C. W. Kreidel, Verlagsbuchhandlung * Wiesbaden * Borgmann, The analysis of wines. 3591

S. Simon, Verlagsbuchhandlung * Berlin * Seubert, Text-book of the knowledge of wares. 3592

Julius Springer, Verlagsbuchhandlung * Berlin * Works on food. Works and publications of the Kais. Gesundheitsamt. 3593

Chr. Herm. Tauchnitz, Verlagsbuchhandlung * Leipzig * Tschirsch-Osterle, Anatomical atlas on food studies. 3594

Vandenhoeck und Ruprecht, Verlagsbuchhandlung * Göttingen * Dragendorff, Legal chemical researches on poisons. 3595

Fr. Vieweg & Sohn, Verlagsbuchhandlung * Braunschweig * Stohmann, Milch; Lippmann, Different kinds of sugar; Strohmann-Kerl, Handbook of technical chemistry. 3596

Joint Exhibition for the Combating of Disease (Bacteriology and Experimental Therapy),

instituted by the Kais. Gesundheitsamt and the Königl. Preuss. Ministerium der geistlichen, Unterrichts- und Medizinal-Angelegenheiten. See Education p. 378.

Kaiserliches Gesundheitsamt * Berlin * 3597
a) Legal regulations for the prevention and cure of leprosy, cholera, petechial fever, plague, small pox, abdominal typhus, and anthrax; b) Tuberculosis, typhus, and dysentery report; c) Model of the gas generator apparatus for the destruction of rats on ships; d) Microphotogram of the plague bacillus; e) Wall charts. The embryonic development of protozoen; f) micro-photographs of the

capricorn beetle as transmitter of the Hæmoglobinury of cattle (Texas fever); g) photographs of tetralogical growth of bacteria; h) illustration of the decrease in mortality*); i) plastic and graphic illustration of tuberculosis of the lungs as a cause of incapacity for work on part of the recipients of invalid pensions; k) and l) diagrams regarding the frequency of death from tuberculosis of the lungs and inflammations of the respiratory organs; m) 18 diagrams concerning deaths from small-pox in European States; n) diagram concerning the spread of cholera in Hamburg 1892; o) plastic representation concerning small pox, diphtheria and childrens bed fever; p) diagram concerning hydrophobia among dogs; q) diagram concerning glanders among horses.

3598 **Knappschaftsverein Bochum** * Bochum * Publication regarding vermination.

3599 **Prof. Dr. Hermann Dürck** * München * Preparations concerning the Plague, preserved in their natural colours. Illustrations in reference to the Plague, leprosy and small-pox.

3600 **Dr. Karl Enoch, Serumlaboratorium "Ruete Enoch"** * Hamburg * Diphtheria, Erysipelas, Antistreptococs, Antistaphylococ serum, tuberculine.

3601 **Prof. Frosch, Leiter des bakteriologischen Untersuchungsamtes** * Trier * Modern principles for combating Typhus (pamphlet).

3602 **W. Gans, Pharmazeutisches Institut** * Frankfurt a. M. * Serum against swine fever, septic pneumonia of calves, poultry cholera; Antidysentery serum.

3603 **Rud. A. Hartmann** * Berlin S., Gitschiner Strasse 65 * Maschinenfabrik, Eisen- u. Metallgiesserei. Spec.: Apparatuses for the destruction and commercial utilisation of all kinds of animal remains.

3604 **Helisberg (Ostpreussen)** * Serum Institute. Swine fever serum and pure cultures of erysipelas.

3605 **Staatliches Hygienisches Institut Hamburg** * Illustrations and preparations showing the origin and cure of bronchitis according to Prof. Dunbar.

3606 **Medizinalabteilung des Kgl. Preussischen Kriegsministeriums** * Berlin * Illustration of the spread of abdominal typhus in European armies.

*) For statistical tables see grp. 140. Statistics regarding duration of life, births and deaths.

F. & M. Lautenschläger * Berlin N. 24 * First special factory for hospital and laboratory fittings, sterilisers, bacteriological apparatuses. Model of a bacteriological laboratory, transportable typhus laboratory. 3607

E. Leitz * Berlin * 1 microscope, stand A. for all purposes of bacteriological research. 1 lense microscope. 3608

Obermedizinalrat Dr. Lorenz * Darmstadt * The method used in the Grand Duchy of Hesse to suppress swine fever. 3609

Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M. * Sero-therapeutic and bacteria preparations as well as illustrations of places where they were made. 3610

E. Merck, Chemische Fabrik und bakteriologisches Laboratorium * Darmstadt * Branches in Moscow and London; Merck & Co., New York and St. Louis. All chemicals required in medicinal pharmaceutical use, especially alkaloids and glucosides as well as the following special preparations: bromipine, dionine, jodopine, styptizine-tannoform, tropacolaine, veronal, 30 per cent pure hydrogen peroxide, further highly efficient diphtheria curative serum, streptococ sesrum, pneumococ serum, anthrax serum, thyreoid serum, jequiritol and jequiritol serum; all reagent tests for medicinal, pharmaceutical and technical purposes; chemical preparations for microscopical, bacteriological and photographical use as well as preparations for producing incandescent gas light, preparations for the textile, firework, perfumery, zymological and similar industries. 3611

Podewils' Fabriken Augsburg G.m.b.H. Nachfolger v. Podewils' Fäkalienextraktfabriken A.G. in München, gegr. 1881 * Working up of refuse matter, slaughter house refuse, blood, corpses, leather cuttings, fecal matter, &c. During the course of the year over 30 plants after Podewils system have been laid down, amongst others in Hamburg, Dresden, München, Odessa, Fray Bentos, Zürich, 's Grafenshage, Vienna, Graz. 3612

Rietschel & Henneberg * Berlin-Dresden * Factory for technical hygienic appliances. Speciality: Sterilisers for sterilising expectoration, fecal matter, expectorating flasks, bed pans, bandages, &c. 3613

M. Schanze, Feinmechaniker * Leipzig * Microtom, model B 30 with 3 knives and 1 knive holder. See grps. 19 and 74 p. 379 and 415. 3614

3615 **Chemische Fabrik auf Aktien (vorm. E. Schering)** * Berlin N. * Founded 1854 by E. Schering, Limited Co. since 1871. Employs about 750 workmen and a staff of 125 persons in 2 large establishments. — Wares required in Medicine, Pharmacy, Photography and Technical Industries manufactured in purest quality. Awards at all important Expositions. The factory also supplies especially durable photographic Paper. Antistreptococ serum, tested by government for the efficacious combating of all illnesses caused by streptococs, for instance, scarlet fever, puerperal fever, rheumatism in the joints. Diphtheria curative serum, highly efficient, tested by the Government. Utensils for disinfecting with formaline gas, patented in all countries and awarded numerous prizes, for the disinfection of rooms without removing the furniture and fittings.

3616 **Oskar Schimmel & Co., A.-G.** * Chemnitz * Maschinenfabrik. Founded 1861. 600 workmen. Appliances for steam, washing and disinfection establishments according to own method.

3617 **W. & H. Seibert, Optisches Institut** * Wetzlar and Berlin * Factory of optical instruments of precision, special microscopes for bacteriologists, mineralogical and other purposes. Exhibits: 1 large microscope for bacteriology with 2 oculars and 3 objectives.

3618 **Serumgesellschaft m. b. H.** * Berlin-Landsberg a. W. * Septizidine for swine fever and hog cholera.

3619 **Tierärztliche Abteilung des Kgl. Württembergischen Medizinalkollegiums** * Stuttgart * Process for the suppression of swine fever.

3620 **Carl Zeiss, Optische Werkstätte** * Jena * 1 binocular microscope, 1 microscope.

Group 141.

Municipal Improvement.

3621 **Kaiserliches Gesundheitsamt** * Berlin * a) 4 paintings of model plants water supplies, b) 3 paintings of model plants for purifying waste water, c) model of a dwelling, d) Diagram of the methods of water supply in the different towns of Germany, the removal of refuse as well as figures concerning mortality and births.

3622 **Statistisches Amt der Stadt Dresden** * Comparison of the attendance at the Public Baths of different towns and their water supply.

3623 **H. Brink, Armeelieferant in Militärfahrzeugen** * Kassel * Established 1869. Conveyances, machines and arrangements for the hygienic removal of dust, street cleaning, watering, removal of mud and snow, patent hollow axles and stocks.—School room fittings, forms to lift up for the hygienic cleaning of the floor, ventilation plant for gymnasiums, &c. Complete school fittings in accordance with all hygienic requirements.

3624 **Siemens & Halske** * Ozone apparatuses of different sizes for scientific and industrial purposes.—Ozone water works for reliable sterilisation of water for a central supply

In this group the municipalities of the following towns are also included in the German Hygiene Exhibition (see Exhibition of towns p. 381 and 502):

Barmen.	3625
Bautzen.	3626
Berlin.	3627
Bonn.	3628
Breslau.	3629
Bromberg.	3630
Cöln a. Rh.	3631
Dortmund.	3631a
Dresden.	3632
Frankfurt a. M.	3633
Halle a. S.	3633a
Kassel.	3634
Kiel.	3635
Kottbus.	3636
Leipzig.	3637
München.	3638
Strassburg i. E.	3638a
Wiesbaden.	3639
Würzburg.	3640

b) Exhibit of the Imperial Insurance Office and the Imperial Statistical Office in Berlin.

Groups 129 and 135.

3641 Reichs-Versicherungsamt Berlin * Tabular and pictorial demonstration of the legislative measures, management, legal terminology and statistics of German workmen's insurance. Printed matter.

3642 Kaiserl. Statistisches Amt, Berlin * Statistical works on the economical and social condition of the German nation, workmen's statistics, sick insurance, and printed matter.

3643 Bielefeldt, Geh. Reg.-Rat in the Imperial Insurance Office * Workmen's insurance, and national health reports.

3644 Prof. Hartmann, Geh. Reg.-Rat in the Reichs-Versicherungsamt * Protection against accidents, and inspection of hygienic working conditions.

3645 Dr. Klein, Reg.-Rat in the Reichs-Versicherungsamt * 1. Statistics of workmen's insurance; 2. Collected essays on workmen's insurance.

3646 Knappschafts-Berufsgenossenschaft, Berlin * Pictorial description of the "Bergmannsheil" Hospitals at Bochum and Bergmannstrost in Halle.

3647 Management of the Berlin Red Cross Ambulance Society * Pictorial and statistical description of the Berlin ambulance stations.

3648 Landes-Versicherungsamt of the Province of Brandenburg, Berlin * Drawings and descriptions of the consumptive homes for women at Kottbus near Kolkwitz. Three framed drawings, the rest in the album.

3649 Landes-Versicherungsamt of the Province of Hanover * Pictorial description and plans of the convalescent homes at Stübeckshorn.

3650 Landes-Versicherungsamt of the Hanseatic Towns, Lübeck * Pictorial description with plans and drawings of the convalescent and invalid home at Gross-Hansdorf.

3651 Prof. Dr. Lass, Reg.-Rat in the Reichs-Versicherungsamt * Workmen's insurance. 1. Its origin and social significance; 2. its organisation and results.

3652 Dr. Leo, Reg.-Rat in the Kaiserl. Statistischen Amt * Organisation of the official workmen's statistics for Germany.

3653 Prof. Dr. Mayet, Reg.-Rat in the Kaiserl. Statistischen Amt * 1. Statistics of sick insurance; 2. Essays on statistical subjects, mostly agrarian.

3654 Ortskrankenkasse, Leipzig * Pictorial description of the "Augustusbad" convalescent home, and of the convalescent homes and hospitals at Gleesberg, Förstel, and Stötteritz.

3655 Dr. Pietsch, Reg.-Rat in the Reichs-Versicherungsamt * Statistics of invalidity insurance.

3656 "See-Berufsgenossenschaft," Hamburg * Pictorial description of safety appliances on German transatlantic steamers.

3657 Landes-Versicherungsamt of the country of Thuringia, Weimar * Pictorial description of the invalid home at Etzelbach in the Saale valley.

3658 "Volksheilstättenverein" of the Red Cross, Berlin * Pictorial and statistical description of the convalescent homes in the neighbourhood of Berlin, with plan.

3659 Dr. Wolf-Becher and Dr. Rudolf Lennhoff of Berlin * The aims, method and results of the German convalescent homes.

3660 Dr. Zacher, Geh. Reg.-Rat in the Reichs-Versicherungsamt * A description of the system of workmen's insurance in separate pamphlets: 1. Germany; 2. Other countries.

3661 Prof. Dr. Zahn, Reg.-Rat in the Kaiserl. Statistischen Amt * 1. Workmen's insurance and national economy; 2. Organisation and results of the German workmen's insurance, with appendix; 3. The protection of the German workmen; 4. Statistical essays on economical and social subjects.

c) Exhibit of the Royal Prussian Ministry for Trade and Industry.

Groups 135, 136, 138 and 139.

See Mining and Metallurgy p. 492 and 493.

2. Single groups.

Group 138.

General progressive movements.

Exhibit of the united railway systems of the Kingdom of Prussia and the Grand Duchy of Hesse.

See Transportation p. 473.

Group 141.

Municipal Improvement.

3662 Prof. Max Läuger * Karlsruhe * Artistic fountain in pottery constructed on own system for municipal parks, school gardens, &c. See grps. 14, 37 and 46 p. 401, 446—448 and 465.

3663 Magistrat der Stadt Augsburg * a) Plan and photographs of municipal baths; b) Photograph of the shower bath at the "Jakobertor;" inaugurative address with description on the grounds.

3663a Magistrat der Stadt Barmen * a) Description of main rain-water and sewage drains (with plans); b) Section of double conduit, only arrangement of separating (drawings); c) Two portfolios with drawings of separate constructions and standards for separating system; d) Waterworks, Reservoir (drawings); e) Municipal Hydropathic and swimming baths (plans and drawings); f) "Realgymnasium" (drawings and photographs); g) National school in the Kleestrasse (drawings).

3664 Stadtrat der Stadt Bautzen * Model of the town of Bautzen, provincial capital of the Margraviate of Oberlausitz, Saxony. 30,000 inhabitants. Exceedingly picturesque situation on the Spree, with many fine memorial buildings from the middle ages. Important industrial enterprises: Weigang Bros., largest art lithographic works in Germany (52 automatic printing presses) for cigar box covers, cigarette packings, fruit and wine labels. Exports to all parts of the world. Manufacture of fancy and coloured papers. Waggon and machine works "Actien-Gesellschaft vorm. Busch." Railway carriages for full and narrow gauge, tram-cars, motor cars, steam fire engines, iron foundry. United paper works. Papers for autotypy, copper plate printing, illustrations, music printing, and coloured papers for artistic printing. "König Albert" copper works (C. G. Tietzen's son-in-law); sheet copper, bowls, locomotive fire-boxes. Cloth factory Ltd. Co.; novelties in gentlemen's clothing, combed yarn, cheviot and knitting yarn. Mechanical weaving works Bautzen Ltd. Co.; jute spinning and weaving, packing linen and sacks for cement, sugar, &c. Stelzer works for tin enamelling and punching. Enamelled house and kitchen utensils, and medical bowls and vessels.

3665 Magistrat der Kgl. Haupt- und Residenzstadt Berlin * a) Reliefmap of Berlin and its surroundings; b) Plan of radial-system No. 1 showing sewage system; c) Model of parts of the irrigation field; d) Model of a sewer-cleaning apparatus; e) Disinfecting institution (photographs and appliances); f) Water-works: model, perspective view of the water-works, at Müggelsee, Lichtenberg, Tegel, Charlottenburg, Belforter Strasse, and Tempelhofer Berg; g) Model of the "Oberbaum" bridge; h) Ten photographs of Berlin bridges; i) Fire station and registrar's office, Fischerbrücke (drawings); k) School in the Christianiastrasse (drawing, photographs and model); l) School in the Grenzstrasse (drawings, photographs, and models of the whole, of a bay, of pillar joinings, and of the chief entrance); m) School in the Wiclefstrasse (models of the façade of the school building and of the dwelling house, models in relief); n) School in the Waldemarstrasse (drawing); o) School in the Waldenserstrasse (drawings and model of the entrance); p) School in the Wilmsstrasse (drawings, photographs and model of the façade of the dwelling house); q) School in the Rigaer Strasse (photographs); r) School in the Dunckerstrasse (photograph); s) Two Artizans schools (drawings, models of the whole, and of an entrance); t) Refuge hall, Friedrichshain (photograph).

3666 Magistrat der Stadt Bernburg * Municipal brine baths (strongest in Germany), Pump room, bridge over the Saale, and refrigerator buildings.

3667 Magistrat der Stadt Bielefeld * Plans of the "XI. Bürgerschule," built in 1901 at a cost of 230,000 marks. Gymnasium in the ground floor and basement; shower baths and milk kitchen in basement.

3668 **Magistrat der Stadt Bonn** * Eight synoptical plans of the historical development of the town of Bonn.

3669 **Magistrat der Kgl. Haupt- und Residenzstadt Breslau** * a) Portfolio of statistical descriptions of the school system; b) Pestalozzi School (ground plan, elevation, and perspective); c) National school in the Fürstenstrasse (ground plan, section, and perspective); d) Intermediate school for boys, Teichäckern (ground plan, elevation, and perspective); e) Evangelical girls school of St. Katherine (ground plan, elevation, and wall paintings); f) Elizabeth "gymnasium" ground plan, elevation and section, and perspective); g) Description of botanical school garden; h) Description of gardening plot for National school children; i) Description and photograph of schools for cookery and housekeeping; k) municipal school--museum (diapositives); l) Plan of organisation of the municipal night and trade schools (a book, manuscript).

3670 **Magistrat der Stadt Bromberg** * Detailed drawings and models of the double pipes for the separating system of the present sewerage.

3671 **Magistrat der Stadt Charlottenburg** * Model of the public library and reading room 1:25. Comprehensive view of the art industrial and handicraft school. Plans of gas works II. Pictorial description of the gas supply system. Plan of the development of the lighting system of the town.

3672 **Der Rat der Stadt Chemnitz** * Chief centre of the machine and textile industries of Saxony. Plans of the town; the market place, monuments, and parks. School of cookery. Nursery garden. Reservoirs.

3673 **Magistrat der Stadt Cöln a. Rh.** * a) Water works (plans of pumping stations and of the system of mains 1:10,000, curves of working, photographs); b) Plan of the town with description of its development and hygienic appliances, and panorama seen from the Rhine; c) Slaughter house and cattle market (plans, models of the slaughter house for hogs, refrigerator and the large abbatoirs, with description. Total cost of erection 6,017,000 marks. Largest in the Rhine province); d) Model of waggon for clearing away refuse without uncleanliness: price 1,000 to 1,200 marks: the waggon is closed in on every side with self acting openings to receive the refuse.

3674 **Grossherzogliche Bürgermeisterei der Haupt- und Residenzstadt Darmstadt** * a) Middle school in the Bessunger quarter (Façades and ground plan); b) Industrial school for boys (ground plan).

3675 **Magistrat der Stadt Dortmund** * a) Water colour sketch and photographic views of the restored old "Rathaus" (Stadtbaurat Kullrich, architect); b) Model of a part of the irrigation field 1 to 300, or 1 to 150; c) Gobelins in the Rathaus. (See W. Ziesch & Co., Berlin SO.

3676 **Der Rat zu Dresden** * a) Architectural development of the town of Dresden (plan, nineteen sheets descriptive of the water works); b) Section of a street (two sheets); c) Expenses of street cleaning (plan); d) Knacking yard (model of the machine room, photographs of buildings, departments, and tables connected with them, &c. productions of the institution striking bolt for killing dogs); e) Time tables, pictorial descriptions, geographical home knowledge and photographic views of the workshops, holiday homes and childrens homes, of school life, &c. Description of sanitary system.

3677 **Magistrat der Stadt Duisburg** * Kaiserberg with gardens and playgrounds. Drawings and photographs. Extensive gardens in which 12,000 children are collected on national patriotic holidays to play, and are fed.

3678 **Magistrat der Stadt Düsseldorf** * Interior of the lecture hall of a higher school for boys. Plan of the town and drawings descriptive of the drainage. Sewage farms. Improvements of the wharfage on the Rhine.

3679 **Magistrat der Stadt Elberfeld** * Description of several new buildings for national and higher schools. Wall paintings by Professor Spatz of the "Real-Gymnasium." Photographs of the suspended railway between Elberfeld and Barmen.

3680 **Magistrat der Stadt Frankfurt a. M.** * Drawings of the Frankfort water works system; b) of the Frankfort filtration works; c) Plan of the breaches in the old town; d) Laying out plan of the "Riesheide" district; e) Drawings of school buildings in Frankfort; f) Water colour, the town hall, Frankfort; g) Album of photographs of the Frankfort rublish carts.

3681 Magistrat der Stadt Görlitz * Relief map of Görlitz in layers of milimeter thickness.

3682 Magistrat des Stadtkreises Guben * Framed drawings of water works. a) Plan of situation showing system of mains. b) Profile of the district. c) Ground plan and profile of the pumping station.

3683 Magistrat der Stadt Halberstadt * Public baths. Drawings. Built in 1899 at a cost of 300,000 marks. Newest arrangements of cubicules, shower baths. Hot air and steam baths. Suitable works to a town of medium size.

3684 Magistrat der Stadt Halle a. d. Saale * a) Model of the Kaiser Wilhelm Memorial b) Model of the Zoological Garden. c) Model of a filtring station.

3685 Magistrat der Kgl. Haupt- und Residenzstadt Hannover * a) Gardens and pleasure grounds (two plans). b) Municipal school museum (one volume). c) Reports, school programmes, &c. (one volume). d) Public baths (four drawings). e) Plan of building extension (one sheet). f) Register of the national-school system (one volume). g) Ordinances and decrees school (one volume). h) Fire brigade: hydrant waggon, gas fire-engine, steam fire-engine.

3686 Magistrat der Stadt Hildesheim * a) School building Hildesheim, (framed photographs). b) Special exhibit of the Hildesheim Handicraft School for boys (descriptive tables, photographs of the class rooms, board with display of work produced by the boys, and a selection of other school work, and printed matter).

3687 Magistrat der Residenzstadt Kassel * a) Model and plans of the filtering stations. Station for the mechanical purifying of drainage water, feces included. Simple management, low cost of working and good results. (Silver medal, Paris 1900.) b) School house specially constructed for the instruction of mentally abnormal children ("Hilfsschule.")

3688 Magistrat der Stadt Kiel * a) Models of street-cleaning appliances. 1 : 5 (dust carts, watering carts, sweeping, machines combined with sprinklers). b) Gas works, Wik (photograph of the coalyard). c) Waterworks, Schulensee (model of the system of purifying from iron, drawing and photograph of the works, drawing of the hauling and purifying departments). d) Water tower Ravensberg (drawing and photograph).

Magistrat der Stadt Kottbus * Sewerage 3689
pumping station: a) Bird's eye view of the whole showing the river Spree and filter bed. b) Ground plan of the power station.

Stadt Leipzig * a) Hochbauamt: 1. New 3690
"Rathaus" (perspective section and ground plan). 2. Royal Conservatorium of music (view, perspective section and ground plan). 3. Hospital Dösen (perspective of the whole, and plan of situation). 4. Waisenhaus, view and plan of site. 5. Tenth district school (perspective view). 6. Central school-garden (photograph). 7. School gymnastics (photograph). b) Tiefbauamt: 1. Thirteen plans of the survey of an area of the town of 3,500 hectares in extent. 2. Nine plans of the municipal filtration beds for drain water (70,000 cubic metres daily) and three plastic descriptions of the chemical and bacteriological composition of the drainage water.

Magistrat der Stadt Magdeburg * 3691
a) Views of the town of Magdeburg (three paintings). b) Public gardens and parks (plans of survey, drawings and photographs).

Magistrat der Stadt Mainz * a) Post- 3692
folio of views, ground plans and sections of various National school buildings in the town of Mainz. b) Eight photographs and drawings (wood-framed ground plans and views of various school buildings). c) Seven plans of the Crematorium.

Magistrat der Stadt Mannheim * 3693
a) Harbour works, survey plan of the whole, with special reference to the municipal industrial wharfs. Latter built 1897–1903, at a cost of about seven million marks. b) Building-zone plan.

Magistrat der Stadt Metz. 3694

Magistrat der Kgl. Haupt- und Residenz- 3695
stadt München * Karl Müller's Peoples Bath (endowed) perspective and turning stands with fifteen tables. b) Plan of the architectural development of Munich. c) Cemetaries (plans of situation, drawings and views). d) Photographs and drawings of school buildings, model of the "Stieler" school, turning stands with photographs and views. e) Statistical material.

Stadtmagistrat Nürnberg * a) School 3696
house in the Bismarckstrasse (pen and

ink drawing). b) School house on the Melanchthonplatz (pen and ink drawing). c) School house in the Goethestrasse (photograph and drawing of the ground plan). d) School house in the Knauerstrasse (pen and ink drawing and ground plan). e) School house in the Findelgasse (photograph). f) School house in the Holzgartenstrasse (photograph). g) Plan of school "barrack." h) Photographs of school kitchens.

3697 **Magistrat der Stadt Plauen I. V.** * 1. Plauen. Road viaduct over the Syratal. Solid arch of ninety metres span. Erected at a cost of 500,000 marks. 2. Town-park, Plauen.

3698 **Magistrat der Stadt Strassburg I. E.** * a) Four tables: carvings and decorative smith work. b) Three tables: modelling and turned work. c) Five tables: cabinet-makers' and turners' work, and flat carving. d) Knitting frames. e) Three tables of drawings and two of photographs.

3699 **Stadtschulthelssenamt Stuttgart** * 1. Relief of the town of Stuttgart and environs, with projected extensions. Condition in 1903. 2. Stuttgart, municipal workmens' dwelling houses, comprehensive pictures with ground plans, showing peculiarities. Unique group of buildings with one, two, and three roomed flats. Cost of erection 450,000 marks. 3. School buildings, Stuttgart, comprehensive views with ground plans. a) "Wilhelmsrealschule;" combination of school, gymnasium, and school courts expedient under difficult conditions of ground; gas heating. b) "Ostheimer" School, national school; central corridor with conveniences for clothing. Gas heating; school baths; picturesque situation. c) "Schwab" school, National school; side corridor with extensions for clothing; gas heating; school baths.

Magistrat der Stadt Wiesbaden * 3700
a) Photographs of bath houses (baths of the High School for girls, baths in the Roonstrasse, of the Gutenbergschule, Blücherschule, in the Kirchhofsgasse, and the Kurhaus. c) Theatre foyer (photographs and models). d) Models (dispensary of the Kurhaus, the Nerotal, the Dambachtal, fish farm, and the Salzbach canal). e) Description of the working of the canal. f) Description of the cleaning of the sediment basin.

Magistrat der Stadt Worms * Workmen's dwelling houses, Worms, of the commonwealth building society, erected by municipal aid since 1897. One storied building with overhanging attics, garden plot. Drawings. 3701

Stadtmagistrat Würzburg * 1. Two plans of the development of the capital and university town of Würzburg (Bavaria). 75,496 inhabitants, 3,216 hectares area. 2. Two maps with graphic description of the vineyard areas, their productiveness, the sale prices of the wines of the "Bürgerspital" from 1876 to 1901. 3. Ground division map of Würzburg showing a) the wine producing surface, and b) the vineyard property of the municipally managed charitable establishment, the "Hospice (Bürgerspital) of the Holy Ghost." 3702

See advertisements p. 8.

German-Tyrolese Alps.

Designer: Hermann Knauer * Berlin W., Viktoria-Luise-Platz 9.

Execution: Boswau & Knauer, G. m. b. H. * Berlin W., Viktoria-Luise-Platz 9.

The arrangement follows an original system which has already taken prizes at the following exhibitions among others: Industrial Exhibition at Berlin in 1896, Thuringian exhibition of trades and industries of 1897, German Building Exhibition at Dresden in 1900, L'exposition universelle de Paris 1900, International exhibition of fire brigade and rescue at Berlin in 1901, and the trades, industrial and art exhibition at Düsseldorf in 1902. The ascents, foregrounds. panoramas, &c., are also arranged on original systems.

The following artists, business houses and exhibitors have contributed to the exhibit:

3713 **Prof. Jos. Rummelspacher** * Berlin * Panoramas, Dioramas and landscapes. See grp. 37 p. 457.

3714 **Schaeffer & Walcker** * Berlin * Fairy fountain and enchanted grotto.

3715 **Emil Gobbers** * Düsseldorf * Representation of the original "Passion play" of Oberammergau by means of electrically projected paintings.

3716 **Deutsche Automatengesellschaft Stollwerck & Co.** * Cöln on Rh. * Automatic orchestra and automatic machines. See p. 416.

3717 **Stange & Wagner** * Berlin * Placards and postcards.

There is also in the German-Tyrolese Alps a separate exhibition of paintings by the **Landesverband für Fremdenverkehr in Tirol** and which have been sent in by the following artists or exhibitors.

3718 **Franz von Defregger** * München * 1. "Episode in the defence of the Tyrol in the war of independence (1809)." 2. "A call to arms (1809)." 3. "Speckbacher and his son (1809)." 4. "The landlord of Tharer (1809)." 5. "Pilgrim in the Tyrol." See p. 390.

3719 **Mathias Schmid** * München * 1. "The robbers of the air." 2. "The letter carrier." 3. "Before the feast." 4. "A lonely height." See p. 394.

3720 **Frau Rose Schmid-Görlinger** * "Portrait of herself."

3721 **J. Wopfner** * 1. "To the rescue." 2. "Landscape study on the Isar." 3. "On the Chiemsee." 4. "Excursion near Ober-Bozen."

TABLE OF CONTENTS AND CLASSIFICATION GENERAL

TABLE OF CONTENTS.

A. Introductory articles concerning the various Trade, Industrial, &c. branches and classification of Exhibits.

Introductory articles.

	Page
Agriculture	280
Art, German	152
Art Industry	158
Book Industry:	
1. Economical and Technical aspect	166
2. Artistic considerations	175
Chemical Industry, German	193
Cities, German	353
Educational Matters, German:	
1. Introduction	115
2. Universities, Technical Colleges and other scientific Institutions	116
A. General Survey	116
B. Scientific Chemistry in Germany	122
C. Physics and kindred Sciences	128
D. Biology	131
E. Medicine	141
3. Upper and Lower Schools	145
Electrotechnics	256
Embroidery, Spachtel, Tambour and Lace Industries in Germany	244
Engineering	200
Food, Articles of	294
Forestry in the German Empire	309
German Empire, The, and its population at the commencement of the Twentieth Century	1
German State Building	105
Glass Industry and Ceramics	226
Hygiene	345
Machinery	250
Metal Hardware	219
Mining, German	318
Motor Cars	263
Musical Instruments	186
Photography and Photo-mechanical printing processes	181
Railways	267
Textile Industry	236
Toys	214
Wine culture, the Wine trade, and the manufacture of sparkling Wines	297
Working classes, Protection of	328
Workmen's Insurance	338

Classification.

Department A. Education.

Group 1. Elementary Education 363–389
Group 2. Secondary Education 363–388
Group 3. Higher Education 363–388
Group 4. Special Education in Fine Arts 363–388
Group 5. Special Education in Agriculture 478. 479
Group 6. Special Education in Commerce and Industry 363–388
Group 7. Education of Defectives 363–388
Group 8. Special forms of Education — Text-books — School furniture and School appliances; Scientific Expeditions 363–399

Department B. Fine Arts.

Group 9. Paintings and Drawings 390–395. 399. 433
Group 10. Engravings and Lithographs 395. 396. 399. 433
Group 11. Sculpture 396–398. 400. 401. 430. 433. 435. 436
Group 12. Architecture 398. 399. 401
Group 14. Original objects of Art workmanship 401. 402. 431. 433. 434. 436

Department C. Liberal Arts.

Group 15. Typography.—Various printing processes 402–405

Page

Group 16. Photography 405–407. 411. 412. 488
Group 17. Books and Publications—Book binding 407–412. 488
Group 18. Maps and apparatus for Geography, Cosmography, Topography 363–388. 411. 412. 488
Group 19. Instruments of precision, physical apparatus, &c. Coins and medals 363–388. 412–415
Group 20. Medicine and Surgery . . 363–388. 416. 473
Group 21. Musical Instruments 416. 417
Group 22. Theatre Appliances and Equipment 417
Group 23. Chemical and Pharmaceutical Arts . 363–388. 417–427. 431. 432
Group 24. Manufacture of Paper . . 427
Group 25. Civil and Military Engineering 427
Group 26. Models, plans and designs for public Works 427. 428
Group 27. Architectural Engineering 428

Department D. Manufactures.

Group 28. Stationary 437
Group 29. Cutlery 437. 438
Group 30. Silversmith's and Goldsmith's Ware 430. 431. 434. 436. 438–440
Group 31. Jewelry 431. 432. 434. 436. 440
Group 32. Clock and Watch making 432. 436. 441
Group 33. Productions in marble, bronze, cast and wrought iron 434. 436. 441–444
Group 34. Brushes, fine leather articles, fancy articles and basket work 432. 444
Group 36. Toys 444. 445
Group 37. Decoration and fixed furniture of buildings and dwellings . 434. 445–457
Group 38. Office and household furniture 434. 435. 457–459
Group 39. Stained Glass 459. 460
Group 41. Hardware 432. 460
Group 42. Paper Hangings . . .460. 461
Group 43. Carpets, Tapestries and fabrics for Upholstery . . 435. 461–463
Group 44. Upholsterers' decorations 463
Group 45. Ceramics 463–465
Group 47. Glass and Crystal . . 465. 466
Group 48. Apparatus and processes for Heating and Ventilation 466
Group 49. Apparatus and methods, not electrical, for lighting 466
Group 53. Equipment and processes used in sewing and making wearing apparel 466

Page

Group 54. Threads and fabrics of cotton 466
Group 55. Threads and fabrics of flax, hemp, &c., cordage 466. 467
Group 57. Silk and fabrics of silk 467
Group 58. Laces, Embroidery and Trimmings 435. 467. 468
Group 60. Leather, Boots and Shoes, Furs and Skins for clothing . . 468. 469
Group 61. Various industries connected with clothing 469

Department E. Machinery.

Group 62. Steam Engines 469. 470
Group 63. Various Motors 470
Group 64. General Machinery . .470. 471
Group 65. Machine Tools 471

Department F. Electricity.

Group 67. Machines for generating and using Electricity 472
Group 68. Electro-Chemistry . . . 363–388
Group 69. Electric Lighting 363–388. 472
Group 70. Telegraphy and Telephony 472
Group 71. Various applications of Electricity 363–388. 472

Department G. Transportation Exhibits.

Group 72. Carriages and wheelwrights. Work-Automobiles and Cycles 473. 474
Group 74. Railways: Yards, Stations, Freight Houses, Terminal facilities of all kinds 473. 474
Group 75. Material and equipment used in the mercantile Marine 474. 475
Group 76. Material and equipment of Naval Services; Naval warfare . . . 475
Group 77. Aerial Navigation 363–388. 475. 476

Department H. Agriculture.

Group 78. Farm Equipments—Method of Improving Lands 476. 479. 480
Group 80. Fertilizers 476
Group 81. Tobacco 480. 488
Group 83. Theory of Agriculture. Agricultural Statistics . .476. 477. 488. 489
Group 84. Vegetable Food products.—Agricultural Seeds 477. 488
Group 85. Animal Food products . . 480. 481. 488
Group 86. Equipment and methods employed in the preparation of foods 481
Group 87. Farinaceous Foods and their derivatives 481
Group 88. Bread and Pastry . 481. 482
Group 89. Preserved Meat, Fish, Vegetables and Fruit 482. 489
Group 90. Sugar and Confectionery. Condiments and Relishes 482. 488. 489

Page

Group 92. Wines and Brandies 483–486
Group 93. Syrups and Liqueurs—Distilled Spirits. Commercial Alcohol 486. 487
Group 94. Fermented Beverages 487. 488
Group 95. Inedible Agricultural Products 488
Group 96. Insects and their products—Plant diseases 488
Group 97. Horses and Mules 489

Department K. Forestry.

Group 112. Appliances and processes used in Forestry 490
Group 113. Products of the cultivation of forests and of Forest Industries 488. 490
Group 114. Appliances for gathering wild crops and products obtained . 488

Department L. Mines and Metallurgy.

Group 115. Working of mines, Ore beds and Stone quarries . . . 491. 493
Group 116. Minerals and Stones, and their utilization 432. 433. 488. 493. 495
Group 117. Mines, models, maps, photographs 491
Group 118. Metallurgy 494
Group 119. Literature of Mining, Metallurgy, &c. 492. 494

Page

Department M. Fish and Game.

Group 120. Hunting Equipment. 488. 490
Group 121. Products of Hunting 488. 490
Group 123. Fishing equipment and products 488

Department N. Anthropologie.

Group 127. Ethnology 488
Group 128. Ethnography 488

Department O. Social Economy.

Group 129. Study and investigation of social and economic conditions . . . 501
Group 135. Provident Institutions 492. 501
Group 136. Housing of the Working Classes 492. 495
Group 137. The Liquor Question 495
Group 138. General Betterment Movement 473. 492
Group 139. Charities and Correction 493. 495–497
Group 140. Public Health 497–500
Group 141. Municipal Improvement 500. 502–505

Department P. Physical Culture.

Group 142. Training of the Child and Adult. Theory and Practice . . 363–388
Group 143. Games and Sport for Children and Adults 363–388
Group 144. Equipment for Games and Sports 363–388

B. Alphabetical List of the Exhibitors.

Collective Exhibits.

Chemical Industry (Chemische Industrie) 417
Galvanic Reproductions of German Silver Work (Galvanische Nachbildungen deutschen Silbergeräts) . . . 439
Music (Musik) 410
Perfumery (Parfümerie) 425
Toy Industry of Sonneberg (Spielwarenindustrie, Sonneberger) 444

Joint Exhibits.

Aerial Navigation (Luftschiffahrt) . . . 475
Agricultural Experimenting Station (Landwirtschaftl. Versuchsanstalt) . 489
Agriculture (Landwirtschaftswesen) . . 476
Agriculture, Domains and Forests, Royal Prussian Ministry for (Landwirtschaft, Domänen und Forsten, Königlich Preussisches Ministerium für . 478
Amber Industry (Bernsteinindustrie) . 431
Anarctic Expedition (Südpolar-Expedition) 389
Arts, fine (Kunst, bildende) 390
Book Industry (Buchgewerbe) 402
Colonial Exhibition (Kolonialwesen) . . 411
Diseases, Combating of (Seuchenbekämpfung) 498
Education (Unterrichtswesen) 363
Food Industry (Nahrungsmittelindustrie) 480
Forestry Management: Royal Prussian (Forstverwaltung, Königlich Preussische Staats-) 490
German-Eastafrican Protectorate (Deutsch-Ostafrika, Schutzgebiet) . . 488
German State Building (Deutsches Haus) 359
German-Tyrolese Alps (Deutsch-Tiroler Alpen) 506

Page

Hospitals for Consumptives (Lungenheilstätten) 495
Hygiene (Hygiene) . . 415. 416. 426. 428. 494
Imperial Insurance Office and Imperial Statistical Office (Reichs-Versicherungsamt und Kaiserliches Statistisches Amt) 501
Künstlerinnen und Kunstfreundinnen, Verein der, Berlin 433
Lace and Embroidery Industry, Plauen (Spitzen- u. Stickereiindustrie, Plauen) 467
Mechanics and Optics (Mechanik und Optik) 373. 412
Photography—Amateur and professional—(Photographie—Fach- und Amateur-) 406
Precious Metal Industry, Hanau (Edelmetallindustrie, Hanau) 430
Public Works, Royal Prussian Ministry for (Öffentliche Arbeiten, Königlich Preussisches Ministerium der) . . . 427
Railways: of the Royal Prussian and Grand Ducal Hessian States (Eisenbahn: Vereinigte Königlich Preussische und Grossherzoglich Hessische Staatseisenbahnverwaltung) . . 416. 473
Schools (Schulwesen) 380
Trade and Industry: Royal Prussian Ministry for (Handel und Gewerbe, Königlich Preuss. Ministerium für) . . 491
Wines (Weine) 483

Single Exhibitors.

Page

Abegg, Prof. Dr. * Breslau 367. 417
Abt, X. * Windelheim (Bayern) 441
Achenbach, Andreas * Düsseldorf 390
Achenbach, Oswald * Düsseldorf 390
Ackerbauschule Badersleben (Prov. Sachsen) 478
Adam, Julius * München 390
Aeronautisches Observatorium des Kgl. Meteorol. Instituts zu Berlin * Berlin-Reinickendorf-West 373. 413
Agrikulturchemische Versuchsstation der Landwirtschaftskammer für die Provinz Brandenburg * Dahme (Mark) 489
Ahrens, Prof. Dr. F. B. * Breslau 364. 417
Akademischer Ruderverein zu Berlin . . . 364
Aktienbrauerei zum Löwenbräu * München . 487
Aktiengesellschaft für Anilin-Fabrikation * Berlin 369–372. 417
Aktiengesellschaft Apollinarisbrunnen * Neuenahr 494
Aktiengesellschaft Aristophot * Taucha-Leipzig and Berlin 405
Aktiengesellschaft für chemische Produkte vorm. H. Scheidemandel * Landshut . 372. 417
Aktiengesellschaft der Chemisch. Produkten-Fabrik Pommerensdorf in Stettin . 367. 417
Aktiengesellschaft H. F. Eckert * Berlin-Friedrichsberg 490
Aktiengesellschaft Falkenstein * Frankfurt a. M. 497
Aktiengesellschaft vorm. H. Gladenbeck & Sohn * Berlin 359. 441
Aktiengesellschaft Lauchhammer * Lauchhammer (Prov. Sachsen) 362. 441
Aktiengesellschaft Norddeutsche Steingutfabrik * Grohn near Bremen 463. 493
Aktiengesellschaft Schaeffer & Walcker * Berlin 415. 417
Aktiengesellschaft für Teer- u. Erdölindustrie * Berlin . . 369–371. 418
Aktiengesellschaft "Weser" * Bremen 427
Albers-Schönberg, Dr. * Hamburg 379
Albrecht, Carl * Hamburg 390
Albrecht-Dürer-Haus Sütterlin & Schöll * Berlin 386
Allgemeine Elektrizitätsgesellschaft * Berlin . 359. 472
Allgemeiner Knappschaftsverein * Bochum 492. 493
Allgemeine Verlagsgesellschaft * München 408
Alt, Theodor * München 390
Altena i. W., Kreis . . . 495
Alter, Ludwig * Darmstadt . 445. 452. 457. 461
Altherr, Alfred & W. Ortlieb * Berlin 445
Altmann, Paul * Berlin 368. 418
Amme, Giesecke & Konegen * Braunschweig 418
Amsberg, Adolf * Aachen 432
Amthorsche Verlagsbuchhandlung * Leipzig 382. 385
Anatomische Anstalt der Universität:
Berlin 374
Breslau 374
Erlangen 375
Göttingen 375
Halle a. S. 375
Heidelberg 375
Jena 375
Königsberg i. Pr. . . . 375
Leipzig 375
München 375
Strassburg i. E. . . . 375
Würzburg 375
Anders, Prof. Rich. * Charlottenburg 387
Anders Andersen-Lundby * München 390

Page

André, Johann * Offenbach a. M. 410
Andreä, Christoph * Mülheim a. Rh. 449. 461
Angermann, Frl. A. * Dresden 449. 461
Anheuser & Fehrs * Kreuznach a. Nahe . . 483
Ankermann, E. * Berlin 433
Anschütz, Prof. Dr. * Bonn-Poppelsdorf . . 364. 365. 368. 369. 418
Antarctic Epedition, German, Chief Prof. Dr. E. v. Drygalski 389
Apel, W. * Göttingen 367. 418
Appel, Frl. * Darmstadt 452. 453
Armbrüster, Gebrüder * Frankfurt a. M. 442
Arndt & Marcus * Berlin 441. 442. 454
Arnold & Braun * Crefeld 361. 467
Aschendorffsche Buchhandlung * Münster (Westf.) 382
A. Asher & Co. * Berlin 382
Astfalck, Conrad * Berlin 360. 456
Auer, A. * Stuttgart . . 410
Augenklinik der Grossherzogl. Universität Freiburg i. Br. 378
Augsburger Verein für Luftschiffahrt * Augsburg 475
Ausstellung der Vereinigten Werkstätten für Kunst im Handwerk * München 400. 401. 435. 436. 438. 440. 441. 448. 459. 465
Axenfeld, Prof. Dr. * Freiburg i. Br. 378

Bach, S. * Neustadt a. Hardt 483
Bachmann, Alfred * München 390
Badersleben, Ackerbauschule 478
Badische Anilin- und Sodafabrik * Ludwigshafen a. Rh. 367. 370. 371. 418. 495
Bähr, Gustav * Charlottenburg . . . 463. 493
Bähring, Julius * Sonneberg 444

Page

Baensch, Heinrich * Lettin b. Halle 463
Baer, Fritz * München 390
Bärenfänger, Max * München 395
Bäuerle, Math. * St. Georgen, Bad. Schwarzwald 441
Bäumler, Georg * Frankfurt a. M. 396
Baier, J. G. * Plauen i. V. 467
Baisch, H., † * Dresden 390
Baldes, Carl * Frankfurt a. M. 456
Ball, A. S. * Berlin 454. 457
Ballin, M. * München 362. 448. 458
Bamberg, C. * Friedenau-Berlin 373. 412
Bantzer, K. * Dresden . 390
Baranek, Josef * Berlin 451. 459
Bard, Marquardt & Co. * Berlin 407
Barmer Teppich-Fabrik Vorwerk & Co. * Barmen . 360. 361. 449. 461
Barmer Verein für Gemeinwohl 495
Bartels, Georg * Göttingen . 367. 373. 412. 418
v. Bartels, Hans * München 390
Barth, Joh. Ambros. * Leipzig . 364. 418. 498
Basedow, Heinrich * Berlin 390
v. Bassus, K. * München 475
Bastian, Charles * Strassburg i. E. 401. 454
Bauer, Heinr. * Frankfurt a. M. 482
Bauersachs, Emil * Sonneberg 444
Bauersche Giesserei * Frankfurt a. M. 402
Baumbach, Max * Berlin 396
Baumgart, Ernst * Südende b. Berlin 456
Bayerische Kunststeinwerke des Württembergischen Portland-Zementwerkes, Lauffen a. Neckar * München 447
Beck, Dr. * Leipzig . . . 372
Beck, C. H. * München 387
Becker * Göttingen . . . 376
Becker, Alb. * Magdeburg 450. 460
Becker, Carl * Düsseldorf 390

Page

Becker, Karl, † * Berlin 390
Beckmann, Prof. Dr. Ernst * Leipzig. 365. 366. 369. 370. 372. 418
Becksche, C. H., Verlagsbuchhandlung, Oskar Beck * München . . . 382
Begas, Reinhold * Berlin 396
Behmer, Marcus * München 436
Behrend, Prof. Dr. * Hannover 369. 418
Behrens, C., & Co. * Schlanstedt, Province of Saxony. 477
Behrens, Prof. Christian * Breslau 359. 361. 362. 456
Behrens, Prof. Peter * Düsseldorf 401. 411. 445. 448
Behrens, Frau, Lilli * Düsseldorf . . . 401. 448
Beisswänger * Stuttgart 379
Bekel, Max * Hamburg-Barmbeck 373. 412
Belaieff, M. L. * Leipzig 410
Belsersche Verlagsbuchhandlung, Chr. * Stuttgart 382
Bembé, A. * Mainz 452. 458
Benade, Jul. * Erfurt . 406
Benda, Prof. Dr. * Berlin 375. 378
Benjamin, A. J. * Hamburg 410
Benjamin & Co. * Berlin 461
Benneke & Lattey * Magdeburg . . . 451. 461
Benz & Co., A.-G. * Mannheim 473
Benz & Rast * Darmstadt 453. 459
Bergbaufeld Luisenfeld, Berlin 488. 493
Bergbaugesellschaft "Neu-Essen" * Essen a. R. 492
Berger, A. * Dresden 438. 449
Bergische Volksheilstätten für heilbare Lungenkranke 495
v. Bergmann, Prof. Dr. * Berlin 375
Bergmann, J. F. * Wiesbaden 498
Bergmann, Julius * Karlsruhe 399. 454
Bergwerks-Gesellschaft Hibernia * Herne (Westfalen) 491

Page

Berkling, Wilhelm * Plauen and Pausa i.V. 467
Berlin-Brandenburger Heilstättenverein . . . 495
Berliner, Dr. Paul * Berlin 375
Berliner Ceresinfabrik Graab & Kranich * Rixdorf 426
Berliner Elektro-Plated-Waren-Fabrik * Berlin 438
Berliner Holzdrahtrouleauxfabrik E. Boeck * Berlin 461
Berliner Krankenmöbelfabrik, E. Wulff & Hohmann * Berlin . . 473
Berliner Verein für Luftschiffahrt 475
Bernau, W. * Berlin . . 360. 361. 463
Berner, Eugen * München 435. 436
Berner, Prof. E. F. * Stuttgart 438. 455
Berthold, H., A.-G. * Berlin 403
Bertram, R. * Leipzig . 410
Bertrand * Dresden . . 438. 449
Bertrich, Bad. 494
Bertsch, Karl * München 448
Bertuch, A. * Berlin 362. 463
Beschor, L. * Hanau a.M. 430
Bethel, Anstalt * Freistadt b. Varel 479
Beukemann, Dr. W. * Hamburg 497
Beumers, C.A. * Düsseldorf . . 438. 440. 441. 448
Beyer, Theodor * Dresden 403
Beyrer, Eduard * München 396. 400. 447
Beyrer, Eduard, jun. * München 450
Biberfeld, Arthur * Berlin 449
Bibliographisches Institut (Meyer) * Leipzig 403. 407
Biehringer, Prof. Dr. * Braunschweig . . 369. 418
Biel, W. * Itzehoe near Hamburg 377
Bielefeldt * Berlin . . . 501
Bieling, Hugo * Steglitz-Berlin 373. 412
Bier, Prof. Dr. * Bonn 376
Billing, Prof. Hermann * Karlsruhe 401. 446

Page

Biltz, Prof. Dr. Heinrich * Kiel 366. 369. 418
Biltz, Dr. W. * Göttingen 366. 418
Binder, Emil * Pforzheim 438. 440
Bing, Bernh. * Nürnberg 488
Bing, S. B., Söhne * Nürnberg 488
Binz, Hermann * Karlsruhe 400. 446
Biologische Abteilung für Land- und Forstwirtschaft am Kaiserlichen Gesundheitsamte zu Berlin 477
Biologische Anstalt des Kaiserlichen Gesundheitsamtes * Berlin . 478
Birkenholz, Peter * München 401
Birmelin, Wilh. * Pforzheim 438. 440
Blank, Hugo * Berlin 369. 419
Blochmann, Prof. Dr. * Königsberg 364. 367. 418
Block-Niendorff, Mathilde * Berlin 433
Bloss, Carl * München 390
Blüthner, J. * Leipzig 360. 416. 450
Bochumer Verein für Bergbau- und Gussstahlfabrikation * Bochum . . 361. 492. 494
Bock, Otto * Berlin . . 490
Bockenheimer, Dr. * Berlin 375
Bödiker, Carl, & Co. * Bremen 389. 489
Böhlaus, Hermann, Nachf., Inh.: Gerhard Dommering & Albert Hartung * Weimar . 382
Böhler, F. L., & Sohn * Plauen i. V. 467
Böhm, A., & Sohn * Augsburg 410
Böhme, Moritz * Berlin 376
Boehringer, C.F., & Söhne * Mannheim-Waldhof 369. 371. 372. 418
Boeltzig, Reinhold * Berlin 396
Börner, Franz August * Berlin 395
Börner & Hertzberg * Berlin 377
Böttcher, A. * Berlin . 385

Page

Bohrdt, H. * Berlin . . 390
Bohrmann, P. B., Nachfolger * Frankfurt a.M. 362. 438
Bolle, C. * Berlin 377
Bollinger, Prof. Dr. * München 375
Bommerlunder Fabrik * Flensburg 487
Bonde, O. * Altenburg 387
Borchardt, Dr. * Berlin 375
Borchers, Prof. Dr. * Aachen . . 364. 367. 418
Borgfeldt, Geo & Co. * Sonneberg 444
Bormann, G., Nachfolg., Inhaber Max Otto * Berlin 437
Bornträger, Gebrüder * Berlin 382
Bosch, J. u. A. * Strassburg i. E. 373. 412
Bosselt, Rud. * Düsseldorf 400. 448
Boswau & Knauer * Berlin 359. 362. 428. 447. 506
Botanische Staatsinstitute * Hamburg . . . 479
Bote, Ed., & G. Bock * Berlin 410
Boveri, Prof. * Würzburg 374
Boysen, J.L. * Darmstadt 452
Bracht, Eugen * Dresden 390
Braith, A. * München . 390
v. Brandis, August * Berlin 390
Brandstetter, Friedrich * Leipzig 382
v. Brandt, Josef * München 390
Brauer, Adolf * Dresden 410
Braun & Schneider * München 407
Braunagel, Paul, und August Cammissar * Strassburg i. E. 454
Braunerova, Zdenka * Roztek b. Prag 433
Brausewetter, Otto * Berlin 390
Bredig, Prof. Dr. * Heidelberg 364. 367. 418
Bredow, Adolf * Stuttgart 400. 455
Bredt, Prof. Dr. * Aachen 368. 370. 418
Breitkopf & Härtel * Leipzig 386. 407. 410. 450

Page

Bremer, Hugo * Neheim a. d. Ruhr 362. 472
Brendel, R. * Grunewald (Berlin) . . . 385. 478
Breslauer & Meyer * Berlin 407
Breslauer & Salinger * Berlin 398
Bretting & Römer * Magdeburg 450. 461
Breuer, Peter * Berlin 397
Bringer, Hubert * Darmstadt 452. 463
Brink, Heinrich * Kassel-Wahlershausen 388. 427. 500
v. Brocken, Maria * Berlin 434
Brockhaus, Max * Leipzig 410. 450
Bruck, G. * Berlin . . . 377
Bruckmann, Ernst * Heilbronn a. Neckar . 405
Bruckmann, P., & Söhne * Heilbronn a. Neckar 438. 454
Brüggemann, Friedrich * Hannover . . 474. 490
Brühlsche Univ.-Buch- und Steindruckerei, R. Lange * Giessen . 403
Brütt, A. * Berlin . . . 397
Brunck, Prof. Dr. * Freiberg i. S. 365. 366. 418
Brunnée, R. * Göttingen 373. 412
Buchhandlung des Traktathauses * Bremen . 410
Buchholz, Albert * Grünberg i. Schl. 486
v. Buchka, Prof. Dr. * Berlin 364. 418
Buchner, Prof. Dr. E. * Berlin . . . 370. 372. 418
Buckauer Porzellanmanufaktur * Buckau . . 451. 463
Buczilowsky, A. * Berlin 387. 388
v. Buddenbrock, Marianne * Berlin 434
Bülow, Prof. Dr. * Tübingen 370. 418
Bürck, Paul * Magdeburg 451
Bürgerliches Brauhaus * München 488
Bürgermeisteramt der Hauptstadt Mannheim 495

Page

Bütschli * Heidelberg . 374
Buhl, F. P. * Deidesheim 483
Buhtz, Walter * Magdeburg 451
Bund der chemigraphischen Anstalten Deutschlands * Berlin 359. 403. 405
Bunge, Paul * Hamburg 373. 412
Bunte, Prof. Dr. * Karlsruhe i. B. 365. 418
Burger, Gertrud * Berlin 433
Burger, Reinhold * Berlin. 373. 412
Burger-Hartmann, Sophie * Basel 400. 435. 436. 447
Burkhardt, Arthur * Glashütte i. S. . 373. 412
Burmester, Georg * Kiel 390
Busch, Prof. Dr. * Erlangen 371. 418
Busch, Georg * München 397
Busch, Louis * Mainz . 442. 452. 460
Busch, C. du Fallois Söhne * Crefeld. . . . 407
Butz, Richard * Magdeburg 461
Buyten, J., & Söhne * Düsseldorf . . . 448. 458

Callwey, Georg D. W. * München 407
Calorit * Berlin 482
Calvary & Co. * Berlin 407
Cammissat, August, & Paul Braunagel * Strassburg i. Els. . . . 459
de la Camp, Dr. * Berlin 376
v. Canal, G. * München 390
Car, H. M. * Flensburg 407
Carisch & Jänichen * Mailand 410
Carré, Gerda * München 400
Casino-Gesellschaft * Trier a. d. Mosel. . . . 483
Caspar, Ludwig * Leipzig 450
Caspari, Robert * Berlin 455. 463
Cassella, Leopold & Co. * Frankfurt a. M. . . . 370. 371. 418
Cerebotani, Prof. Dr. * München 472

Page

Chemische Fabrik auf Aktien (vorm. E. Schering) * Berlin . 377. 500
Chemische Fabrik Alt-Herzberg, Alwin Nieske * Dresden-N. 367. 419
Chemische Fabrik Durlach, Dr. Neuberg * Durlach (Baden) . . . 419
Chemische Fabrik Elektron Akt.-Ges. * Griesheim 367. 370. 419
Chemische Fabrik Gernsheim-Heubruch * Mannheim 367. 369—372. 419
Chemische Fabrik Hönningen, vorm. Walther Feld & Co. Akt.-Ges. * Hönningen a. Rh. 367. 419
Chemische Fabrik, Dr. Eugen Schaal * Feuerbach 372. 419
Chemische Fabriken, vormals Weiler-ter-Meer * Urdingen a. Rh. . . 370. 371. 419
Chemisches Institut, Erstes * Berlin 365. 419
Chemisches Institut * Bonn 365. 419
Chem.-techn. Fabrik Dr. Alb. R. W. Brand & Co. * Charlottenburg . . . 456
Chemisches Untersuchungsamt des Kgl. Polizeipräsidiums * Berlin 426. 497
Chirurgische Universitätsklinik:
Berlin 375
Bonn 376
Breslau 376
Kiel 376
Königsberg i. Pr. . . . 376
Leipzig 376
Christ, Fritz * München 397. 400. 435. 447. 448
Christian, D., & Sohn * Meisenthal (Lothring.) 454. 465
Christoph & Unmack, Akt.-Ges. * Niesky (Oberlausitz) 377
Chun, Prof. * Leipzig . 374
Cissarz, J. U. * Darmstadt 399. 452. 453
Classen, Prof. Dr. A. * Aachen . . 364. 367. 419

Page

Clemens, W. * München 390
Cölner Ceresinfabrik Gebrüder Maus * Cöln a. Rh. 369
Cölner Heilstättenverein 495
Cohen, Prof. Dr. * Göttingen 368. 419
Conrad, Prof. Dr. * Aschaffenburg . 369. 419
Conradty, C. * Nürnberg 362. 472
Continental-Caoutchouc- und Guttapercha-Compagnie * Hannover . 412. 473
Continental-Gesellschaft für elektrische Unternehmungen * Nürnberg 428. 474
Le Coq, A., & Co. * Darmstadt 477
Cordes & Co. * Hannover 427. 493
Coschell, Moritz * Berlin 390
Cosomati, Ettore * Frankfurt a. M. 395
Cotta, J. G. * Berlin 382. 387
Cotta, J. G. * Stuttgart 407. 410
v. Cotta, Ilse * Berlin . 434
Cowl, Dr. * Berlin . . . 376
Crämer & Héron * Sonneberg 444
v. Cranach, W. Lucas * Berlin 440
Cremer & Wolffenstein * Berlin 398

Dahlen, H. W. * Wiesbaden 483
Daimler-Motoren-Gesellschaft * Cannstatt 473
Dasio, Max * München 436
v. Defregger, Franz * München 390. 506
Deines, Peter, Söhne * Hanau a. M. 431
Deipser, Prof. Dr. * Neuwied 387
Deister jun., Friedrich * Gau-Algesheim a. Rh. 483
Delmenhorster Linoleumfabrik * Delmenhorst bei Bremen 360. 461
Delp & Karn * Mainz . 452
Dennstedt, Prof. Dr. * Hamburg . 368. 371. 419
Deppermann, Henny * Berlin 433
Detert * Berlin 377

Page

Detmolder Stuckfabrik Albert Lauermann * Detmold 360. 361. 455. 456
Deuss & Oetker * Crefeld 448. 461
Deutsche Auslandsschulen zu Antwerpen, Brüssel, Bukarest und Konstantinopel 380
Deutsche Automatengesellschaft Stollwerck & Co. * Cöln a. Rh. 416. 506
Deutscher Buchgewerbeverein * Leipzig 402. 403. 407
Deutsche chemische Gesellschaft * Berlin . . 364. 368. 419
Deutsche Dichter-Gedächtnis-Stiftung * Hamburg-Grossborstel 382
Deutsche Export-Revue Berlin and Stuttgart 407
Deutsche Gasglühlicht Akt.-Ges. * Berlin 362. 466
Deutsche Gesellschaft für Chirurgie * Berlin 376
Deutsche Glasmosaikgesellschaft Puhl & Wagner * Rixdorf-Berlin 466
Deutsche Heilstätte at Davos near Wolfgang in Graubünden (Schweiz) 495
Deutsche Landwirtschaftsgesellschaft * Berlin 476. 477
Deutsche Lincrustawerke (Pallas-Marke) Gerhard & Co. * Höchst a. M. 453. 461
Deutsche Linoleum- und Wachstuch-Compagnie Rixdorf and Eberswalde . . . 360. 362. 461
Deutsche Metall-Fräs- und Stanzwerke, Fiedler & Goldberg * Dresden 481
Deutsche Milchkonservenfabrik Walcker & Co. * Bremen and Loxstedt i. Hann. 480
Deutsche Orientgesellschaft in Berlin 363
Deutsche Steinindustrie-Aktiengesellschaft, vorm. M. L. Schleicher * Berlin . . 359—361. 456

Page

Deutsche Südpolar-Expedition, Leiter Prof. Dr. E. v. Drygalski . 389
Deutscher Verein für Knabenhandarbeit zu Leipzig 388
Deutsche Verlagsanstalt * Stuttgart . . . 408
Deutsche Zentralstelle für klassische Skulpturen, Kunstanstalt August Gerber * Cöln a. Rh. 360. 361. 363. 365. 386. 420. 442
Dick, Friedrich * Esslingen a. N. . 437. 438. 471
Diebener, Wilhelm * Leipzig 409
Diederichs, Carl, Inh.: Spindler & Hoyer * Göttingen 368. 420
Diederichs, Eugen * Leipzig 407
Diehl, August * Hamburg 416
Dielitz, Konrad * Berlin 390
Diels, Dr. O. * Berlin 369. 372
Diesterweg, Moritz * Frankfurt a. M. 382
Dietler, Adolf * Freiburg i. B. 446. 458
Dietrich, Robert * Merseburg 427
Dietrich, Wilhelm * Leipzig 410
Dietsche, Prof., Fridolin * Karlsruhe 400. 442. 445. 447. 453
v. Diez, Wilhelm * München 390
Dill, Prof. L. * Karlsruhe 446
Dillmann, E. * Charlottenburg 434
Dimroth, Prof. Dr. * Tübingen 370. 420
Dinges, J. * Mindelheim (Bayern) 384
Dittmar, W. * Magdeburg 450
Dittmars Möbelfabrik * Berlin . . . 377. 445. 458
Doebner, Prof. Dr. * Halle a. S. 369. 370. 371. 420
Döring, Willi * Berlin 391
Dorfschule zu Datum-Nienhöfen (Kreis Pinneberg, Prov. Schleswig-Holstein) 381

Page

Dorst, Julius * Sonneberg 444
Drägerwerke * Lübeck 376. 491
Dralle, Georg * Hamburg and Altona . . . 425
Drechsler, Fritz * Leipzig 450
Dresdener Werkstätten für Handwerkskunst * Dresden 449. 458. 460
Dressel, Cuno & Otto * Sonneberg 444
Dressel, Wilhelm * Sonneberg 444
Drexel, Gebrüder * Frankfurt a. M. 483
Dreyer, Rosenkranz & Droop * Hannover 373. 412
Drinneberg, Hans * Karlsruhe i. B. 446. 447. 459
Drude, Prof. Dr. * Giessen 368. 420
Drugulin, W. * Leipzig 407
v. Drygalski, Prof. Dr. * Berlin 389
Duchrow, Glasmalerei * Magdeburg 451. 459
Duckert * Freienwalde 479
Dücker, Eugen * Düsseldorf 391
v. Dühren, C. J. * Berlin 406
Dührkopp, R. * Hamburg 406
Dülfer, Prof. Martin * München . 398. 401. 447
Duensing, F. * Fürstenwalde 490
Dürck, Prof. Dr. Hermann * München 379. 499
Dürfeld, Carl * Chemnitz i. S. 450. 462
Dürr, Alphons * Leipzig 408
Dürrsche Buchhandlung * Leipzig 382
Düsseldorf-Ratinger Röhrenkesselfabrik vormals Dürr & Co. * Ratingen near Düsseldorf 469
Dunn, Fred., & Co. * München . 440. 442. 447
Dustless * Berlin 377

Ebbecke, Friedrich, Verlag * Lissa i. P. . . . 382. 385. 388
Eberhardt, Max * München 359. 417. 470
Eberlein, Gustav * Berlin 397
Eberth, Leopold * München 438. 440
Eccardt, C. F. * Kreuznach a. Nahe 483
Echter, A. * München . 391
Ecke, P., Schmidt & Cie. * München 449. 458. 462
Eckel, Gebrüder * Deidesheim (Rheinpfalz) . . 483
Eckerts Nachfolger * Darmstadt 453. 463
Eckstein & Kahn * Stuttgart 361. 455. 466
Eckstein & Stähle * Stuttgart 403
Egersdörfer, Andreas * Frankfurt a. M. 391. 456
Eggers, H. C. E., & Co. * Hamburg 359. 456
v. Egidy, Emmy * München 401. 438. 440
Egyptian Cigarette Company * Berlin 480
Ehmcke, F. H. * Düsseldorf 448. 467
Ehrentraut, Jul. * Berlin 391
Ehrlich, Prof. Dr. * Frankfurt a. M. 378
Eichheim * München . 456
Eichhorn, C. H. * Plauen i. V. 467
v. Eichler, Nelly * Eurasburg near München 400. 442
Eichstädt, Rudolf * Berlin 391
v. Eicken, E. * Halensee 433. 435
Eilers, Gustav * Berlin 395
Eisenhütten- und Emaillierwerk * Neusalz a. O. 438
Eisenmann, R. * Berlin 369. 420
Elbs, Prof. Dr., Karl * Giessen . . 364. 368. 420
Elchinger, Ph., & Söhne * Sufflenheim, Elsass 454. 464
Elektromotor * Berlin 377
Elektro-Photochemische Industrie * Berlin . . 405
Elisabeth-Gymnasium zu Breslau 386
Elkan, Walter * Berlin 436. 442. 450
Elmendorf, E. F. * Isselhorst in Westfalen . . 486
Elsässische Maschinenbau-Gesellschaft * Mülhausen i. E. 469
Elwertsche, H. G., Verlagsbuchhandlung (W. Braun) * Marburg (Hessen) 382
Emmerling, Prof. Dr. * Berlin . . . 369. 372. 420
Encke, Th. * Magdeburg 450. 458
Endell, Hedwig * Wilmersdorf 435
Endell, Martha * Wilmersdorf 435
Endner, Friedr. * Darmstadt 452. 453. 459
Engel, Otto Heinrich * Berlin 391. 395
Engelhardt, Georg, Hermann * Berlin 391
Engelken, Dr. H. * Alt-Scherbitz 407
Engelmann, Wilh. * Leipzig 498
Engler, Prof. Dr. * Berlin 374
Engler, Prof. Dr. * Karlsruhe i. B. 368–370. 420
Enke, Ferd. * Stuttgart 376. 498
Enoch, Prof. Karl * Hamburg 379. 499
Enslin, Otto * Berlin . 498
Epler, Heinrich * Dresden 397
Erdmann, Prof. Dr. Ernst * Charlottenburg . . . 365. 368. 420
Erdmann & Spindler * Berlin 398. 401
Erdtelt, Alois * München 391
Erfurth * Dresden . . . 406
Erhardt, Otto * Coswig-Dresden 407
Erler, Frau Margarethe * Berlin 433
Ern, C. Friedr. * Wald (Rheinland) 437
Erzgiesserei "Renaissance" * München 442. 448
Escher jun., E. * Sonneberg 444
Eschke, Richard * Berlin 391
Ette, Fritz * Eisleben . 406
Etzold & Popitz * Leipzig 432
Eulenburg, Ernst * Leipzig 410. 450
Evangelisches Pädagogium zu Godesberg a. Rh. 380

Page

Exhibit of the "Vereinigten Werkstätten für Kunst im Handwerk" * München 400. 401. 435.436.438.440.441. 465
vanEyken,Moritz*Berlin 395
Eysser, J. A. * Baireuth (Bayern) 447. 458

Faber, A. W. * Stein bei Nürnberg 437
Faber, Oswald * Leipzig 387. 388
v. Faber du Faur, Otto, † * München 391
Fabian, Max * Berlin . 395
Fabricius, Rich. Daniel * Dresden 397
Fahrner, Theodor * Pforzheim 440. 446
Fahrzeugfabrik Heinr. Brink * Kassel-Wahlershausen. 428
v. Falkenstein, Freifrau Mary, geb. Garraway * Berlin 434
Fambach, Ch., und Hagner, Alb. * Mainz 442. 452
Farbenfabriken vorm. Friedr. Bayer & Co., Akt.-Ges. * Elberfeld 369–372. 420
Farbwerke vorm. Meister Lucius & Brüning * Höchst a. M. . 367. 369–372. 379. 420. 499
Fechner * Potsdam 373. 412
Fechner, Hanns * Berlin 391
Fechner,Wilhelm*Berlin 386
Fehrmann, Fritz * Tilsit (Ostpreussen) . . 431. 432
Feist, Gebrüder & Söhne * Frankfurt a. M. 483
Feist, Otto * Karlsruhe i. B. 400. 446
Feldl, Philipp * Berlin 445
Feldmann, Louis * Düsseldorf 391
Feldmann, Wilhelm * Berlin 391. 395
Felsing, O. * Berlin 403. 405
Fennel, Otto, Söhne * Kassel 478
Ferner, G., & Sohn * Kaiserslautern, Pfalz 406
Feuerbach, Anselm, † * Düsseldorf 391
Fichtelgebirgs-Verkaufs-Genossenschaft*Ansbach, Bayern 477

Page

Fiessler, Louis, & Co. * Pforzheim 440
Fink, August * München 391
Finsterwalder, Prof. S. * München 475
Firle, Walther * München 391
Firnberg, B. * Frankfurt a. M. 410
Fischer, A. E. * Bremen 410
Fischer, Clara Elisabeth * Berlin 433. 434
Fischer, Erhard * München 400
Fischer, Prof. Dr. E. * Berlin 365. 368–372. 420
Fischer, Prof. Dr. F. * Göttingen . 364. 365. 420
Fischer, F. L. * Freiburg i. B. 380
Fischer, Gustav * Jena 378. 382. 385
Fischer, Prof. Dr. O. * Erlangen 370. 420
Fischer, S. * Berlin . . 408
Fischer, S. F. * Oberseiffenbach (Erzgebirge) 388. 444
Fischer-Gurig, Adolf * Dresden 391
Fischers Medizinische Buchhandlung (H. Kornfeld) * Berlin . . 387
Fischer & Franke * Düsseldorf 408
Fisher, Th. G., & Co. * Kassel 385
Fleischer, Dr. * Berlin . 479
Fleischmann, Gebrüder * Sonneberg 444
Fleischmann, A., & Crämer * Sonneberg . . . 444
v. Flesch-Brunningen, Ludmilla * München 391
Flickel, P., † * Berlin . 391
Flügge, Prof. Dr. * Breslau 378
Fock, Gustav * Leipzig 382
Förster, Paul * Berlin 459
Förster & Borries * Zwickau in Sachsen . 382
Forberg, Otto * Leipzig 450
Forberg, Robert * Leipzig 410. 450
Forell,Robert*München 391
Fraenkel, Dr. A. * Berlin 377
Fränkel, Prof. Dr. B. * Berlin 375
Fränkel, Prof. Dr. C. * Halle a. S. 378

Page

Frank, Adolf * Charlottenburg 479
FrankfurterRekonvaleszentenverein 495
Franz, J. * Sonneberg 444
Frauberger, Frau T. und Frl. Irene * Düsseldorf 448. 467
Frauenarbeitsschule: Heilbronn 455. 467 Reutlingen . . . 455. 468 Stuttgart 455. 468 Ulm 455. 468
Freese, Ernst * Berlin . 397
Frei, Eduard * Darmstadt 441. 442. 453. 458. 462
Freier Verlag * Berlin. 409
Frenz, Alexander * Düsseldorf 391
Freudemann, Victor * Berlin 391
Freund, Prof.Dr.*Frankfurt a. M. 371. 420
Freyeisen, Gebrüder * Frankfurt a. M. 488
Freytag, G. * Leipzig . 382
Freytag, G., & Berndt * Wien 384
Fricke, H. * Hamburg . 387
Friedländer, Gebr. * Berlin 360. 440
Dr. Friedmanns Erben * Blankenhain. 497
Friemann & Wolf * Zwickau i. S. 491
Fries, Phil. * Zürich . . 410
Friese, Richard * Berlin 391
Fritz, Oskar * Berlin . . 442. 449
Frohse, Dr. * Berlin . . 375
Fromm, Prof. Dr. * Freiburg i. B. 369. 370. 420
Frosch,Professor*Trier 379. 499
Frost, H., & Söhne * Berlin 359–362. 442. 460
Fürbringer, Prof. Dr. * Heidelberg 375
Fürstenau, Eduard * Berlin 398
Fürstl. Bergwerksdirektion Waldenburg in Schl. 492
Fürstl. Stolbergsches Hüttenamt*Ilsenburg 442. 450
Fürstlich Wildunger Mineralquellen, A.-G. Wildungen 494

Page

Fürstner, Ad. * Berlin 410
Fuess, R. * Steglitz-Berlin 373. 412
Fugel, Gebhard * München 391
Fuhr, Prof. Fr. * Karlsruhe 399. 453
Fuks, Alexander * München 391

Gabriel, Prof. Dr. * Berlin . . . 370. 371. 420
Gagel, Prof. * Karlsruhe 446
Gailsche Dampfziegelei * Giessen 452. 464
Gaisser, M. * München 391
Galvanoplastische Kunstanstalt * Geislingen 440
Gampert, Otto * München 395
Gans, W. * Frankfurt a. M. 499
Garré, Prof. Dr. * Königsberg i. Pr. 376
Gasmotorenfabrik Deutz 470
Gast, J. * Berlin 473
Gaul, Prof. A. * Wilmersdorf bei Berlin . 442
Gautsch, Conrad * Berlin (Subdirektion) . . 359
Gebel, B. W., Inh.: Bruno Gebel * Gross-Lichterfelde 382
Gebert, Carl * Ockfen a. Saar 483
Gebhardt, Paul, Söhne * Berlin 385. 478
v. Gebhardt, Eduard * Düsseldorf 391
Gebler, O. * München . 391
Gehlert, Georg * Kiel 442
Gehrckens, C. Otto * Hamburg 470
Gehrig, A. * Karlsruhe 446. 458
Gelsenkirchener Bergwerks-Aktiengesellschaft * Gelsenkirchen 491. 492
Generalverwaltung der Kgl. Museen zu Berlin 363
Genetat, Otto * Friedrichshagen near Berlin 388
Gensmer, Felix * Berlin 398
Gensterblum, Julius Wwe. * Trier a. Mosel 483
Gentz, Ismael * Berlin 395
Genzmer, Berthold * Berlin 391

Page

Genzsch & Heyse * Hamburg 403. 408
Georgens, Wilh. * Magdeburg 451
Gerber, August * Cöln a. Rh. 360. 361. 363. 365 386. 420. 442
Germania-Linoleum-Werke, A.-G. * Bietigheim 359. 455. 462
Germanisches Museum * Nürnberg. 420
v. Gersdorff, Claire * Potsdam 433
Gerson, Frau * Charlottenburg 479
Gerstenbauer, F. * Karlsruhe 447. 458
Gesche, W. * Hamburg 407
Gesellschaft zur Verbreitung klassischer Kunst * Berlin 386
Geselschap, Friedr., † * Berlin 391
Gesenius, Hermann * Halle a. S. 382
Geyer, Carl * Sonneberg 444
Geyger, Ernst Moritz * Florenz 397
Giesel, J., & Co. * Dresden-Plauen 371. 420
Gilka, J. A. * Berlin . . 486
Gladenbecks Bronzegiesserei * Friedrichshagen-Berlin . . . 362. 442
Glaser, F. C. * Berlin . 409
Glaser, Gebrüder * Hanau a. M. 430
Glauer, Max * Oppeln O.-S. 406
Gleichauf, Fritz * Regensburg 410
Glenz, Otto * Erbach i. Odenwald 430
Glückert, J. * Darmstadt 453. 456. 458. 463
Gobbers, Emil * Düsseldorf 506
Göckel, Dr. Heinrich * Berlin 420
Göhmann & Einhorn * Kattowitz, Dortmund 492
Goergens, Wilh. * Magdeburg 451. 459
Goerke, Franz * Berlin 407
Goerz, C. P., Akt.-Ges. * Friedenau near Berlin 405
Göschensche, G. J., Verlagsbuchhandlung * Leipzig 382. 387

Page

Goetz, Johannes * Berlin 397
Götze * Bremen. 428
Goetze, Friedrich * Burscheid bei Cöln a. Rh. 469
Goetze, F. O. R. * Leipzig 373. 412
Goldmann, Clara * Berlin 434
Goldschmidt, J. * Nürnberg 442
Goldschmidt, Dr. Theod. * Essen a. R. . . 367. 421
v. Gosen, Theodor * München 400. 435. 436. 447
Gottheil, Albert * Danzig 406
Gottheil, Emil * Königsberg i. Pr. 406
Gotzes, Th. * Crefeld . 462
Gräfe, Lucas, & Sillem * Hamburg. 382
Grässel, Franz * München 391
Grässel, Hans * München 398
Grätz, Karl * Frankfurt a. M. 456
Graf, Dr., & Co. * Berlin 377
Greeff, Prof. Dr. * Berlin 375. 377
Greeff, Peter * Düsseldorf 391
Greiner, Dr. * Darmstadt 400. 453
Greiner, Ephraim * Stützerbach in Thüringen 373. 385. 412
Grenander, Prof. Alfred * Charlottenburg . . . 454
Gressler, F. G. L. * Langensalza 382
Grethlein & Co. * Leipzig 387
Grimpe * Magdeburg 450. 458
v. d. Groeben, Hedwig * Berlin. 434
Groh, Prof. A. * Karlsruhe 446
Groos, Julius * Heidelberg 409
Groscurth, W. * Berlin 410
Gross, Professor Karl * Dresden 435. 436
Grossherzogliche Bürgermeisterei Darmstadt 503

Page

Grossherzogliche Geologische Landesanstalt * Heidelberg . . 491. 492
Grossherzogliche Majolika-Manufaktur * Karlsruhe i. B. 446. 447. 464
Grossherzogliche Regierung * Oldenburg . . 480
Grossherzogliche Weinbaudomänenverwaltung * Mainz 483
Grossmann, Dr. H. * Münster i. W. . 366. 421
G. Grotesche Verlagsbuchhandlung * Berlin 382. 409
Grünwald & Köllner * Mainz 452
Grützner, Eduard * München 391
Grunmach, Prof. Dr. * Berlin 379
Grunow, Adolf, Gebhardt & Rössel Nachfolger * Berlin . 362. 462
Guenther, Paula * Berlin. 380
Günther & Tegetmeyer * Braunschweig 373. 412
Guhr, Richard * Berlin 360. 445. 456
Gumbold, Joh. * Königsberg i. Pr. 458
Gumlich-Kempf, Anna * Berlin. 391
Gundelach, E. * Gehlberg i. Th. . . . 373. 412
Gundlach, August * Grossalmerode 494
Gusinde, Alois * Berlin. 388
Gutmann, Alfred, Aktiengesellschaft für Maschinenbau * Ottensen-Hamburg . . . 469. 471. 494
Guttentag, J. * Berlin 382
Gutzmann, Dr. Hermann * Berlin 380
Gysis, Nikolaus * München 391

Haarmann & Reimer * Holzminden . . 371. 421
Habich, Prof. L. * Darmstadt 400. 453

Page

Habich, Professor Ludwig * München 436
Hachmeister, Hermann * Sonneberg 444
Haertel, Georg * Breslau 376. 497
Haferland, Wilh., & Co. * Berlin 478
Hagenbeck, Carl * Stellingen b. Hamburg . . 490
Hagener Textilfabrik vorm. Gebr. Elbers * Hagen i. W. 445
Hagn, Richard * Dresden 391
Hahn, Heinrich * Frankfurt a. M. 459
Hahn, Prof. Hermann * München 450
Hahn, Prof. Wilhelm * München 400. 447
Hainauer, Julius * Breslau 410
Halberstädter Wurst- und Fleischkonservenfabrik Heine & Co. * Halberstadt. 482
Halfmann, Heinrich * Crefeld 408
Halle, Bernhard * Steglitz-Berlin 373. 412
Haller, Theodor * Friedrichsdorf am Taunus 481
Hamacher, Willy * Berlin 391
Hamburg-Amerika-Linie * Hamburg . . . 474
Hamburger Motorenfabrik C. Jastram * Hamburg 475
Hamburger & Co. * Berlin 445
Handels- u. Gewerbekammer Sonneberg . 444
Haniel & Lueg * Düsseldorf 427
Hanke, Reinhold * Höhr b. Koblenz 464
Hannoversche Kakesfabriken H. Bahlsen * Hannover 481. 482
Hannoversche Maschinenbau-Aktiengesellschaft vormals Georg Egestorff * Linden vor Hannover 474
v. Hansemann, Prof. Dr. * Berlin 375. 377
Hansing, J. * Hannover 434

Page

Hansing & Co. * Hamburg 488. 489
Hardt, Ferd. * Pforzheim 438
"Harmonie," Verlagsgesellschaft * Berlin 408–410
Harmus jun., Karl * Sonneberg 444
Harries, Prof. Dr. * Charlottenburg 364. 365. 368–371. 421
Harth, J. A., & Co. * Mainz 483
Hartmann, Prof. * Berlin. 501
Hartmann, Arnold * Berlin 398
Hartmann, Carl * München 391
Hartmann, Jakob * Ludwigshafen a. Rh. . . . 406
Hartmann, Johannes * Leipzig. 400. 450
Hartmann, Rud. A. * Berlin 379. 499
Hartmann & Braun, Akt.-Gesellschaft * Frankfurt a. M.-Bockenheim 368. 373. 412. 421. 477. 497
Hartmann, Curt, & Co. * Plauen i. V. 467
Hartung, J. C. * Mühlhausen i. Th. 490
Hartwig, Robert * Sonneberg 444
Harzheim & Hagen * Düsseldorf-Rath. . . . 448
Hasak, Max * Berlin . 398
Hasemann, A. * Berlin 373. 413
Hasse, Prof. Dr. * Breslau 374
v. Hauberrisser, Georg * München 398
Hauff, Albert * Berlin-Schöneberg . . . 385. 388
Hauptner, H. * Berlin . 478
Haushaltungsschule: Hameln 478 Nebra a. U. 478
Hausmann, Ernst * Berlin 391
Hausmann & Latwesen * Kassel. 386
Haustein, Paul * Darmstadt 436. 452. 453
Hauswaldt, H. Dr. * Magdeburg . . . 373. 413

Page

van Hauten, F., Sohn * Bonn a. Rh. . . 442. 465
Haynauer Raubtierfallenfabrik E. Grell & Co. * Haynau i. Schl. 490
v. Heckel, J. * München 447. 463
Heckert, Fritz * Petersdorf i. Riesengebirge. 465
Heele, H. * Berlin 373. 413
Hegermann, L. * Berlin 468
Heichert, Otto * Düsseldorf 392
Heidelberger Gelatinefabriken Stoess & Co. * Heidelberg . . . 372. 421
Heiden, Theodor * München 440
v. Heider, Fritz * Magdeburg 401. 451
v. Heider, Hans * Magdeburg 399. 401. 451
v. Heider, Rudolf * Elberfeld 401. 464
Heil, J. * Hamburg-Wandsbeck 469
Heilmaier, Max * München 397
Heilsberg (Ostpreussen), Seruminstitut 499
Heilstättenverein für den Regierungsbez. Minden 495
Heilstättenverein Nürnberg 495
Heilstättenverein für Lungenkranke im Regierungsbezirk Oppeln 495
Heimes, Heinrich * Düsseldorf 392
Heimster jun., Herm. * Magdeburg . . . 450. 458
Heincke, Prof. * Helgoland 374
Heine, F. * Kloster Hadmersleben (Bez. Magdeburg) 477
Heinemann, Fritz * Berlin 397
Heinrichshofens Musikverlag * Magdeburg 408. 410
Heinsius, M., Nachfolger * Leipzig . 408. 498
Heintze & Blanckertz * Berlin 388
Heising, Bernhard, † * Berlin 397

Page

Helbing, Emil * Wandsbeck 479
Held Nachfolger * Magdeburg 442. 450
Helferich, Prof. Dr. * Kiel 376
Heller, Hans * Darmstadt 399
Heller, Prof. Dr. * Kiel 375
Helzel, Gebrüder * Dresden 465
Hempel, Prof. Dr. * Dresden . . 364. 365. 401. 421
Henckels, J. A., Zwillingswerk * Solingen 437
Henschel, O. * Magdeburg 450
Henschel & Sohn * Kassel 474
Henseler, Ernst * Berlin 392
Hensoldt, M., & Söhne Wetzlar 490
Heraeus, W. C. * Hanau a. M. 366–368. 373. 413. 421. 426. 497
Herbig, Friedr. Aug. * Berlin 382
Herdersche Verlagsbuchhandlung * Freiburg im Breisgau 403. 409
Herkuleswerke * Oberkaufungen bei Kassel 469
Hermann * Dortmund . 406
Hermans, P. W. * Prummern 490
Hermeling, Gabriel * Cöln a. Rh. 438
Héroux, Bruno * Leipzig 395
Herrmann, Hans * Berlin 392
Herrmann, R. * Berlin 362. 442
Herrmann-Allgäu, August * München . . . 392
Herrosé's, R., Verlag * Wittenberg 382
Hertel, C., & Sohn * Hanau a. M. 431
Herter, E. * Berlin . . . 397
Herterich, Johann * München 392
Herterich, Ludwig * München 392
Hertwig, Aura * Charlottenburg 407
Hertwig, Prof. Dr. * Berlin 378
Hertzog, Rudolph * Berlin 359. 362. 455. 458. 462. 463. 468
Hess & Martin * Plauen i. V. 467

Page

Hesses, Max, Verlag * Leipzig 382. 387
Hesslein, S. A., & Co. * Nürnberg 455. 462
Hessling, Bruno * Berlin 409
Hettinger, Dr. * Nordrach i. B. 497
Heubach, Hugo * Sonneberg 444
Heubach, Gebrüder, A.-G. * Lichte b. Wallendorf (S.-M.) 464
Heyden, Carl * Düsseldorf 392
Heyl, Gebr., & Co. * Charlottenburg . . . 367. 421
Heymanns, Carl, Verlag * Berlin 409
Heyser, Friedrich * Dresden 392
Hildesheimer Sparherdfabrik, A. Senking * Hildesheim . . . 362. 466
Hillger, Hermann * Berlin 382
Hilimer, Victor * Berlin 442. 456
Hilsdorf * Bingen a. Rh. 406
Hiltner, Direktor Dr. * München 477
Hinckel & Winckler * Frankfurt a. M. 483
Hinterseher, Joseph * München 400. 447
Hinz, H. * Altona . . . 410
Hirsch, S. * Berlin . . . 444
Hirschmann, H. * Berlin 376
Hirt, Ferdinand * Breslau 383. 384. 386
Hirth, Georg * München 408
Hirth du Frênes, Rud. * München 392
Hirzel, Hermann * München 436
His, Prof. Dr. * Leipzig 375
Hobbing & Büchle * Stuttgart 384
Hoch, Franz * München 392
Hochmann, Franz * Dresden 392
Hochstein & Weinberg * Berlin 405
Hochstetter, B. * Berlin 463
Höchstedt, Anna * Berlin 433. 434
Höhere Töchterschule I. at Hannover 386
Höhere Töchterschule der Franckeschen Stiftungen zu Halle a. S. 386

Page

Hoehl, Gebrüder * Geisenheim a. Rh. 484
Hölbe, Heinr. Rudolph * Dresden 397
Hölzel, Ed. * Wien 384. 385
Hönemann, Martin * Berlin 395
Hoerning, A. * Volkstedt bei Eisleben 477
Hösel, Erich * Dresden 397
Hofer, Prof. * München 374
Hoffa, Prof. Dr. * Berlin 376
Hoffacker, Prof. * Karlsruhe 445
Hoffarth, L. * Dresden 410
Hoffmann, Wilhelm, Akt.-Ges. * Dresden . 403
Hoffmann-Fallersleben, Franz * Berlin 392
Hoffmann, Heffter & Co. * Leipzig 484
Hoffmeister, C. * Sonneberg 444
Hoffmeister, Heinrich * Leipzig 403
Hofmann, Professor * Plauen i. V. 467
Hofmeister, Friedrich * Leipzig 410
Hohner, Matth. * Trossingen 416
Hohns, G. A., Söhne * Crefeld 408
Holde, Prof. Dr. * Berlin 368. 369. 421
Holländer, Theodor, & Co. * München . . . 441. 442
Hollerbaum & Schmidt, * Berlin 403
Holmberg, August * München 392
Holzapfel, Carl * Kassel 392
Hommel, H. * Mainz . 373. 413
Honigmann, Meta * München 436
Horn, Heinrich * Sonneberg 444
Horn, Paul * Hamburg-Eilbeck 426
Horst-Schulze, Paul * Leipzig 392
Howaldtswerke * Kiel 389. 475
Hozák, Karl * Neuendorf-Nowawes near Berlin 454. 462
Huber, Anton * Charlottenburg 454

Page

Huber, Elsa * Mainz 454. 468
Huber, Mathilde * Mainz 454. 462
Hübner, Paul * Berlin 432
Hueck, Eduard * Lüdenscheid . . . 442. 450. 453
Hückels * Berlin 497
v. Hüfner, Prof. Dr. G. * Tübingen 415. 426. 498
Hülsen, Atelier * Berlin 406
Hümer, Paul * Berlin . 458
Hünten, Max * Düsseldorf 392
Huesgen, Adolf * Traben on the Mosel 484
Huesgen, J. W. * Traben on the Mosel 484
Huesgen, Max * Traben on the Mosel . . . 484
Hug, Gebrüder, & Co. * Leipzig 409. 410
Hugershoff, F. * Leipzig 368. 421
Hulbe, Georg * Hamburg 401. 444. 462
Hundrieser, E. * Charlottenburg 397

Ibach, Rud., Sohn * Schwelm, Berlin, Barmen 416. 446
Ichthyolgesellschaft Cordes Hermanni & Co. * Hamburg 372. 421
Ihm, Wilh. * Hanau a. M. 431
Immelmann, Dr. * Berlin 377
Inselverlag * Leipzig . 408
Institut für Meereskunde an der Universität Berlin 374
Intze, Prof. Dr.-Ing. O. * Aachen 427
Invalidenversicherungsanstalt Hessen 496
Iversen, Helene * Berlin 435

Jacob, Julius * Berlin 392
Jacobi, Martin * Berlin 442. 455
Jacobi & Kertell * Frankfurt a. M. 458

Page

Jacobson, Prof. Dr. * Berlin 365. 368. 370. 421
Jacoby, Louis * Berlin 396
Jäger, W. * Könkendorf near Sadenbeck, Priegnitz 477
Jagenberg, Ferd. Emil * Düsseldorf . . 427. 437
Jahn, Adolf * Berlin . 397
Jahn, Georg * Dresden 396
Jahn, G. A. * Plauen i. V. 467
Jahn, R. * Magdeburg 451. 460
Jahns, H. * Magdeburg 451
Janensch, Gerhard * Berlin 397
Janke & Kästner * Leipzig 408
Janssen, Alfred * Hamburg 408
Janssen, Gerhard * Düsseldorf 392
Janssen, Peter * Düsseldorf 392
Janssen, Ulfert * München 436
Jehmlich, Gebrüder * Dresden 416
Jeremias, Adolf * Mainz 484
Jessen, Dr. * Strassburg i. E. 389
Jessen Dr., Dr. Loos, G. Schläger * Strassburg i. E. 389
Jörissen, G. * Marmorbruch Auberg und Wirbelau, Oberlahnstein 456
Johanniterorden * Sorge im Harz 496
Jordan, L. A. * Deidesheim, Forst, Ruppertsberg (Rheinpfalz) . . . 484
Jüdel, Max * Braunschweig 474
Jünger & Gebhardt * Berlin 426
Jung, Adolf * Frankfurt a. M. 482
Jung, R., Inh. W. Löw u. L. Jung Ww. * Heidelberg 376
Junior * Frankfurt a. M. 406
Junker, Hermann * Karlsruhe 392
Junkers, Alex * Berlin 426. 437
Junkers & Co. * Dessau 373. 413

Page

Junne, Otto * Leipzig . 410
Jupiter, elektrophotographische Gesellschaft * Frankfurt a. M. 405

Kafemann, A. W. * Danzig . . . 383. 385. 387
Kagerah, J. * Hamburg 385
Kahnt, C. E., Nachfolger * Leipzig 410
Kaiser, R. * Magdeburg 451
Kaiserin-Auguste-Viktoria-Schule * Stettin 386
Kaiserliches Gesundheitsamt * Berlin . . 379. 426. 428. 494. 495. 497. 498. 500
Kaiserliches Gouvernement Daressalam . . . 488
Kaiserliches Statistisches Amt * Berlin . 501
Kalle & Co. * Biebrich a. Rh. 367. 370–372. 421
Kallenberg, R., & Co. * München 443. 448
Kallmorgen, Friedrich * Berlin 392
Kampf, A. * Berlin. . . 392
Kampmann, Gustav * Grötzingen near Karlsruhe 399. 453
Karlsruher Marmor-, Granit- und Syenitwerke Rupp & Moeller * Karlsruhe 446
Karp * Darmstadt . . . 441. 452. 453
Kast & Ehinger * Stuttgart 403
Katholische Realschule * Breslau 386
Kaufmann, Hugo * München . 400. 436. 441. 447
v. Kaulbach, Fritz August * München 392
Kaulfuss, Th. * Liegnitz 478
Kayser, E. * Cöln a. Rh. 439
Kayser, L. * Berlin . . . 359–362. 457
Kayser-Eichberg, Carl * Berlin 392
Keiser & Schmidt * Berlin. 472. 498
Kell, A. * Plauen i. V. 498
Keller, Ferdinand * Karlsruhe 392

Page

Keller, Heinrich * Frankfurt a. M. 409
Kellner, Dorothea * Berlin 433. 434
Kellner, Marno * Charlottenburg 359. 361. 457
Kempf & Paulus * Plauen i. V. 467
Kerker, Erwin * Breslau 368. 422
Kerm, J. U. * Breslau 498
Kerns Verlag, J. M. (Max Müller) * Breslau 383
Kesselringsche Hofbuchhandlung * Leipzig . 387
v. Kesselstattsche Reichsgräfliche, Majoratsverwaltung * Trier a. d. Mosel 484
v. Keudell, Marie * Berlin 434
Kiefer, Karl * München 397. 400. 447
Kiemlen, Emil * Stuttgart. 397. 400. 455
Kiesel, Conrad * Berlin 392
Kiessling, Paul * Dresden 392
Killmey * Magdeburg 451. 458
Kimbel & Friederichsen * Berlin 359–361. 457. 458. 462
Kindler, Ludwig * München 436
Kindt, Fritz * Steglitz bei Berlin. 384
Kirsch, Reinhold * München 443
Kirsche, O. * Pfiffelbach-Apolda 477
Kirschner, Marie * Berlin . . . 433–435. 445. 449
Kirstein, Dr. A. * Berlin 407
Kissling, Nicol. * Vegesack bei Bremen. . . . 490
Kister, A. W. Fr. * Scheibe (Schwarzburg-Rudolstadt) 464
Kistner, Fr. * Leipzig . 410
Kittel, Paul * Berlin . . 408
v. Kitzing, Berta * Berlin. 433
Klähr * Dresden 387
Klawitter, J. W. * Danzig 427
Klebs, Prof. Dr. R. * Königsberg i. Pr. 431. 432

Page

Kleemann, Prof. G. * Pforzheim. . . . 440. 446
Klein, Dr. * Berlin . . . 501
Klein, Johann * Johannisberg a. Rh. 484
Klein, Max * Berlin . . 397
Kleinsche Buchdruckerei J. B. (M. Buscher) * Crefeld 408
Klemm, Richard * Dresden 464
Klinger, Prof. Dr. * Königsberg. 365
Klinger, Professor Max * Leipzig-Plagwitz . . 400. 450
Klinik für Augenkrankheiten in der Charité * Berlin 375
Klinik für Hals- und Nasenkrankheiten * Berlin 375
Klinik für Haut- und Geschlechtskrankheiten * Berlin 375
Klinkhardt, Julius * Leipzig 404
Knabengemeindeschule 232 * Berlin 381
Knabenmittelschule * Stettin 381
Knabenvolksschule * Hannover-Linden . . . 386
Knabl, Karl * München 392
Knapp, Wilh. * Halle a. S. 365. 406. 422
Knappschafts-Berufsgenossenschaft * Berlin 501
Knappschaftsverein Bochum * Bochum 379. 499
Knauer, Hermann * Berlin. 506
Knaus, L. * Berlin . . . 392
Knodt, G. * Frankfurt a. M. 362. 443
Knöfler, Dr. O., & Co. * Plötzensee bei Berlin 367. 422
Knoll & Co. * Ludwigshafen a. Rh. 371. 372. 422
Knopf, Hermann * München 392
Knorr, Prof. Dr. * Jena 369. 371. 422
Knüppelholz, Paul * Magdeburg . . . 451. 463
Koberstein, Hans * Berlin. 410

Page

Koch, Alexander * Darmstadt 408
Koch, Professor Max * Berlin 360. 457
Koch, Prof. Dr. * Berlin 378
v. Koch, Prof. * Darmstadt 374
Koeberlé, E. * Strassburg i. E. 454. 462
Köchlin, Marie * Strassburg i. E. 454. 468
Köhler, Fritz * Leipzig 368. 415. 422. 426. 498
Koehler, K. F. * Leipzig 383–385
Köhler & Lippmann * Braunschweig 404
König, Andreas * Sonneberg 444
König, H. C. * Steinhagen in Westfalen . . . 486
König, Prof. Dr. J. * Münster i. W. 365. 372. 373. 422
König, Richard * Dresden 397
Koenig & Lengsfeld * Cöln a. Rh.-Lindenthal 443
König & Söldner * München 398
Kgl. Bayrische Agrikulturbotanische Anstalt * München 478
Kgl. Bayrische Porzellanmanufaktur * Nymphenburg bei München 464
Kgl. Preussische Berginspektion * Stassfurt 492
Kgl. Preussische Bergwerksdirektion * Saarbrücken . . . 491–493
Kgl. Preussische Domänenverwaltung * Berlin 484. 493
Kgl. Preussische Forstakademie * Eberswalde 490
Kgl. Preussische Forstakademie * Münden 490
Kgl. Preussische Geologische Landesanstalt und Bergakademie * Berlin 491. 492
Kgl. Preussische Messbildanstalt * Berlin . 399
Kgl. Preussisches Ministerium der öffentlichen Arbeiten * Berlin 399. 427

Page

Kgl. Preussisches Ministerium der geistlichen, Unterrichts- und Medizinal-Angelegenheiten * Berlin 363. 364. 388. 498
Kgl. Preussisches Ministerium für Handel und Gewerbe * Berlin 491
Kgl. Preussisches Ministerium des Innern * Berlin 479
Kgl. Preussisches Ministerium für Landwirtschaft, Domänen und Forsten * Berlin 478. 479
Kgl. Preussisches Oberbergamt * Breslau 491. 492
Kgl. Preussische Staatsforstverwaltung 490
Kgl. Sächs. Bergakademie * Freiberg i. S. . 364. 492
Kgl. Sächsische Landwirtschaftl. Versuchsstation * Möckern . . 489
Kgl. Sächsisches Ministerium für Kultus u. Unterricht * Dresden 364
Kgl. Württembergische Zentralstelle für Gewerbe und Handel * Stuttgart 455
Kgl. Akademie der Wissenschaften * Berlin 363
Kgl. Akademie d. Wissenschaften * München . 363
Kgl. Augusta-Schule mit Kgl. Lehrerinnen-Seminar * Berlin . 381. 386
Kgl. Badeverwaltung Bad Ems 494
Kgl. Badeverwaltung Bad Langenschwalbach . . 494
Kgl. Badeverwaltung Bad Nenndorf b. Hannover 494
Kgl. Badeverwaltung Schlangenbad 494
Kgl. Berginspektion * Stassfurt 492
Kgl. Bernsteinwerke * Königsberg i. Pr. . . . 433
Kgl. Blindenanstalt * Steglitz-Berlin 381
Kgl. Färbereischule * Crefeld 448
Kgl. Gesellschaft der Wissenschaften * Göttingen 363
Kgl. Gesellschaft d. Wissenschaften * Leipzig 363

Page

Kgl. Hofkammer der Königlichen Familiengüter * Charlottenburg 479
Kgl. Julius-Maximilians-Universität * Würzburg 364
Kgl. Kadettenanstalten * Berlin 380
Kgl. Landesdirektorium * Hannover 479
Kgl. Landesschule * Pforta 380
Kgl. Landwirtschaftliche Akademie * Poppelsdorf-Bonn 478
Kgl. Landwirtschaftliche Hochschule * Berlin 478. 489
Kgl. Moorversuchsanstalt * Bremen 479
Kgl. Porzellanmanufaktur * Berlin-Charlottenburg 360. 361. 366. 423. 426. 464. 493. 498
Kgl. Schlossbauverwaltung Homburg 363
Kgl. Spitzenklöppel-Musterschule * Schneeberg (Sachsen) 468
Kgl. Technische Hochschule * Berlin-Charlottenburg 364
Kgl. Universität * Leipzig 364
Kgl. Zeichenakademie * Hanau a. M. . . 430. 431
Kgl. Zentral-Taubstummen-Institut * München 388
Kgl. Botanischer Garten und Museum * Berlin 374
Kgl. Anatomisch-Biologisches Institut der Universität Berlin . . 378
Kgl. Auguste-Victoria-Gymnasium zu Posen 380
Kgl. Friedrich-Wilhelms-Gymnasium * Trier a. d. Mosel 484
Kgl. Gymnasium * Wongrowitz 380
Kgl. Hygienisches Universitätsinstitut * Breslau 378
Kgl. Hygienisches Universitätsinstitut * Halle a. S. 378
Kgl. Institut für experimentelle Therapie * Frankfurt a. M. 378

Page

Kgl. Institut für Infektionskrankheiten * Berlin 378
Kgl. Joachimsthalsches Gymnasium * Berlin 380
Kgl. Landratsamt * Gelsenkirchen 387
Kgl. Lehrerinnenseminar * Burgsteinfurt i. W. 381
Kgl. Messbildanstalt * Marburg 364
Kgl. Museum für Naturkunde * Berlin 374
Kgl. Schullehrerseminar: Bromberg 386
Delitzsch 386
Reichenbach O.-L. . . . 386
Ziegenhals 381
Kgl. Universitätsinstitut für Untersuchung mit Röntgenstrahlen * Berlin 379
Koenigsberg, R. C. * Schwerin i. M. 460
Koerner, Ernst * Berlin 392
Körnig, Arno * Berlin-Wilmersdorf . . . 445. 449
Körschgen, Josef * Düsseldorf 397
Körting, Gebr., Aktiengesellschaft * Körtingsdorf bei Hannover . . 377
Koester, Alexander * Karlsruhe 392
Kohl, Max * Chemnitz 364. 373. 413
Kohlbecker, B., & Sohn * München . . . 448. 458
Kohlrausch, Prof. Dr. * Charlottenburg 368
Kohlrausch, Prof. Dr. * Hannover 387
Kolbe, Georg * Leipzig 400. 450
Kolbow, Fritz * Berlin 375. 380
Kolonialwirtschaftliches Komitee * Berlin 411. 488
Komitee für die Deutsche Nahrungsmittelausstellung * Frankfurt a. M. 480
Koner, Max, † * Berlin 392
Konservenfabrik Albert Rehse Sohn * Wülfel vor Hannover 482
Kons & Pfennings * Berlin 362
Kornhas, Professor C. * Karlsruhe . 401. 446. 464

Page

Kottmann, Gustav * Crefeld 455. 462
v. Kowalski-Wierusz, Alfred * München . . 392
Kraepelin, Prof. * Hamburg 374
Krajca, Florian * Karlsruhe 475
Kramer-Bangart, Edgar * Kassel 410
Krantz, Dr. F. * Bonn 384. 385
Krause, Prof. Dr. * Köthen 365
Krause, Hermann * Berlin 457
Krause, Lina * Berlin 434. 435
Krayn, M. * Berlin . . . 498
Kreidel, C. W. * Wiesbaden 498
Kreis, Prof. W. * Dresden . . 390. 398. 401. 449
Kreitling, Paul * Berlin 377
Kremser, Dr. * Sülzhagen bei Ellrich am Harz 497
Kress, Frl. * Darmstadt 453
Kresse, Oswald * München 396
Kreuter, Fr., & Co. * Hanau a. M. 431
Kreuzberg, Pet. Jos., & Co., Ahrweiler and Frankfurt a. M. 484
Kreysing, G. * Leipzig . 404
Kröner, A. * Breslau . . 376
Kröner, Christian * Düsseldorf 392
Krönig, Prof. Dr. * Berlin 377
Kronberger, Carl * München 392
Krostewitz, Fritz * Berlin 396
Krüger, Albert * Berlin 396
Krüger, Prof. F. A. O. * München 436
Krüger, Franz * Frankfurt a. M. 457
Krüger, G. * Berlin 455. 460
Krüger, H., Wwe. * Schiffbeck near Hamburg . 468
Krüss, A. * Hamburg 373. 411. 413. 415. 426. 488. 498
Krug, Joh. Martin, Nachfolger * Hanau a. M. 431
Krupp, Friedrich, A.-G. * Essen a. R. 492

Page

Kubierschky, E. * München 392
Kübeler, Wilh. * Darmstadt 406
Kuehl, G. * Dresden . . 392
Kühl, Geo, & Co. * Chicago 441
Kühling, Prof. Dr. * Charlottenburg 365. 422
Kühn, Ludwig * Berlin 396
Kühtmann, Gerhard * Dresden 383. 409
Kümmel, Dr. * Hamburg-Eppendorf 376. 379
Kümmel, W. * Berlin 449. 454. 455. 458. 462. 475
Küster, Prof. Dr. William * Stuttgart 372. 422
Küstner, Carl * München 393
Kuhlmann, Heinrich * Bremerhaven 482
Kuhnert, Prof. Wilhelm * Berlin 392. 488
Kulmbacher Exportbrauerei "Mönchshof" Aktiengesellschaft * Kulmbach 488
Kunckell, Dr. * Rostock i. M. 370. 422
Kunheim & Co. * Berlin 367. 422
Kunststickereischule des Badischen Frauenvereins * Karlsruhe i. B. 401. 446. 462. 468
Kunz, L. Adam * München 392
Kunz, M. * Ilizach near Mülhausen i. E. 388
Kuratorium der Berliner Unfallstationen vom Roten Kreuz * Berlin 501
Kuratorium der Heilstätte Edmundsthal . 496
Kutscher, Dr. * Marburg 372. 422

Laboratorium für chemische Feuerschutz- und Löschmittel, Conrad Gautsch * München 359. 417. 471
Ladenburg, Prof. Dr. * Breslau 365. 366. 371. 422

Page

Läuger, Emma * Lörrach (Baden) 446. 462. 468
Läuger, Prof. Max * Karlsruhe 401. 446–448. 465. 502
Lahrs, Friedr. * Charlottenburg 401
Lamey, Camille * Berlin 388
Lampert, Prof. * Stuttgart 374
Landauer, J. * Braunschweig 437
Landauer & Macholl * Heilbronn 486
Landesverband für Fremdenverkehr in Tirol 506
Landesversicherungsanstalt: Baden 496
Brandenburg * Berlin 496. 501
Braunschweig 496
Elsass-Lothringen . . 496
der Hansestädte * Lübeck 496. 501
Hannover 501
Posen 496
Landois, Prof. Dr. Hermann * Münster i. W. 383. 385
Landsberg, Max * Berlin 478
Land- und Seekabelwerke, A.-G. * Cöln-Nippes 472
Landwirtschaftliche Lehranstalt und Haushaltungsschule Hagen i. W. 478
LandwirtschaftlicheVersuchsstation Hildesheim 489
LandwirtschaftlicheVersuchsstation d. Landwirtschaftskammer f. d. Regierungsbezirk Kassel * Marburg a. L. 489
Landwirtschaftliche Winterschule Gross-Förste 478
Landwirtschaftlicher Hauptverein für Ostfriesland, Norden . . 489
Landwirtschaftskammer der Rheinprovinz * Bonn 478
Landwirtschaftskammer für das Herzogtum Oldenburg 476

Page

Landwirtschaftsschule: Cleve 478
Eldena 478
Flensburg 478
Hildesheim 478
Liegnitz 479
Schivelbein 479
Lang, C. A. * Kehlheim 359. 457
Lang, Friedrich * Karlsruhe 443. 446
Lang, Georg * Leipzig 384
Lang, Paul * Magdeburg 451
Langbein, Paula * Magdeburg 451. 468
Lange, Prof. Dr. * Crefeld 371. 422
Lange, A., u. Söhne * Glashütte (Sachsen) . 441
Langen, Albert * München 408
Langenscheidtsche Verlagsbuchhandlung * Berlin 383. 409
Langerhans, Prof. Dr. * Berlin 375. 377
Langhammer, Carl * Berlin 393
Lang-Kurz, Minna * Magdeburg . . . 451. 468
Langwisch, B. Nachf. * Hamburg 426
Lappe, Julius * Neudietendorf i. Th. 486. 487
Lappe, Th. * Neudietendorf i. Th. 487
Lass, Prof. Dr. * Berlin 501
Lassar, Prof. Dr. * Berlin 377. 378
Lattmann, F. A. * Goslar 408
Laubisch, August * Magdeburg 443. 451
Laupheimer, Anton * München 393
Lautenschläger, F. & M. * Berlin . . 376. 379. 499
Lauxmann, Theodor * Stuttgart 393
Leander, G. * Berlin . . 443. 454. 455
Lehmann, Dr. * Altona 374
Lehmann, A. * Königsberg i. P. 432. 433
Lehmann, J. M. * Dresden 481
Lehmann-Felskowski * Berlin 475
Lehmanns, Fritz, Verlag * Stuttgart 409

Page

Lehmanns, J. F., Verlag * München . . . 376. 387
Lehnert, Hildegard, und Clara Lobedan * Berlin 434. 435
Leibl, W., † * Aibling bei Rosenheim 393
Leichner, L. * Berlin . . 417. 425. 426
Leineweber, F. * Leipzig 383. 387
Leipold, Karl * Kiel . . 393
Leitz, E. * Berlin 379. 415. 499
Leitz, E. * Wetzlar a. L. 373. 377. 413
Lemckes, A. C., Schultafelfabrik * Kassel . 388
v. Lenbach, Franz * München 393
Lennhoff, Julius * Berlin 362. 443
Lent, Anna * Berlin . . 433
Lentz, E. A. * Berlin . . 368. 371. 422. 426. 497
Lentz, Ernst * Berlin . . 377
Leo, Dr. * Berlin 501
Lepcke, Ferdinand * Berlin 397
Leppin & Masche * Berlin 373. 385. 413
Lesser, Prof. Dr. * Berlin 375. 377
Lessing, J. * Berlin . . 397
Lessing, Konrad * Berlin 393
v. Le Suise, Hermann * München 393
Lette-Verein * Berlin . . 407
Leuchtenberger, Dr. * Cöln a. Rh. 388
Leuckart, F. E. C. * Leipzig 410. 450
Leuners, Oskar, Mechanisches Institut * Dresden 422
Leutheuser, Richard * Sonneberg 444
Levy-Dorn, Dr. * Berlin 377
Lewy, Siegmar * Berlin 440. 443. 465
Lichtinger, L. * München 443. 447
Liebau, Herm. * Magdeburg 451
Liebe, Dr. G. * Waldhof-Elgershausen bei Wetzlar 497
Liebermann, Prof. Dr. * Berlin . . . 379. 371. 422

Page

Liebert, Gebr. * Dresden 449
Liebig * Fraustadt . . . 388
Liebreich, Prof. Dr. * Berlin 379
Liesegang, H. * Düsseldorf 393
Lind, Gust., Nachfolger * Berlin 443. 457
Lindner, Prof. Dr. * Charlottenburg 373. 422
Lindner, Louis, & Söhne * Sonneberg 444
Links-Emsische Kanalgenossenschaft Lingen 479
Linoleum-Fabrik, Akt.-Ges. * Maximiliansau, Rheinpfalz . . . 446. 462
Linoleumwerke "Hansa" * Delmenhorst 448
Lintz, Jakob * Trier a. d. Mosel 484
Lintz & Eckhardt * Berlin 466
Lion, R. * Hof i. B. . . 387
v. Lippmann, Prof. Dr. * Halle a. S. . . . 365. 422
Lobedan, Clara * Berlin 393
Lobedan, Emma * Berlin 433
v. Loefftz, L. * München 393
Lövinsohn, Dr., & Co. * Berlin-Friedrichsfelde 404
Loevy, S. A. * Berlin 443. 454
Loewenstein, Louis & H. * Berlin 376. 380
Löwes, Ferdinand Carl * Stuttgart 408
Löwith, W. * München 393
Lorenz, C. * Berlin . . . 473
Lorenz, Dr. * Darmstadt 379. 499
Lorenz, Dr. * Quedlinburg 387
Lorenz, Max * Klotzsche-Dresden 407
Lucas, August * Düsseldorf 400. 448
Luckhardt, Friedrich * Leipzig 410
Luckhardts Musikverlag (R. Lebrecht) * Stuttgart 410
Ludwig, K., † * Berlin 393
Lübecker Maschinenbaugesellschaft * Lübeck 427
Lüders, Peter * Hamburg 407
Lührig, Georg * Dresden 396

Page

Lützel, Gebr. * München 406
Lützelberger, Hermann * Sonneberg 444
Lützelberger, J. N. * Sonneberg 444
Luge, A., & Co. * Sonneberg 444
Luksch, Elena * München 436
Lundbeck, Erna * Karlsruhe 446. 467. 468
Lungenheilstätte zu Belzig 378
Lusche, Max * Hof i. B. 406
Luther, G., Akt.-Ges. * Braunschweig . 373. 422
Luthmer, Emmy * Berlin 433. 435
Lux, Friedrich * Ludwigshafen a. Rh. . . . 365. 373. 413. 422. 471
Lysoform * Berlin . . . 378

Maas, G. * Berlin . . . 474
Macco, Robert * Heidelberg . 402. 446. 452. 453
Mädchengemeindeschule, 213. * Berlin 381
Mädchenmittelschule, erste * Stettin 381
Maennchen, Adolf * Düsseldorf 393
Maennchen, Albert * Berlin 445. 457
Märkischer Volksheilstättenverband 496
Magdeburger Verein zur Bekämpfung der Lungenschwindsucht . . . 496
Magistrat der Stadt:
Augsburg 502
Barmen 502
Bautzen 502
Berlin . . . 495. 497. 502
Bernburg 502
Bielefeld 502
Bonn 503
Breslau 503
Bromberg 503
Charlottenburg 503
Chemnitz 503
Cöln a. Rh. . . . 497. 503
Dortmund 503
Düsseldorf 503
Duisburg 503
Elsleben 387
Elberfeld 503
Frankfurt a. M. 387. 503
Görlitz 504

Page

Guben 504
Halberstadt 504
Halle a. S. 504
Hannover 504
Hildesheim 504
Kassel 504
Kiel 504
Königsberg i. Pr. . . . 387
Kottbus 504
Leipzig 504
Magdeburg 504
Mainz 504
Mannheim 504
Metz 504
München 504
Plauen i. V. 505
Posen 387
Quedlinburg 387
Strassburg i. E. 505
Wiesbaden 505
Worms 505
"Magneta" * Singen (Amt Konstanz, Grh. Baden) 472
Magnussen, W. * Bremen 402. 465
Mahla, Dr. * Berlin 370. 422
Mahler, Wilhelm * Worms 484
Maison, Rudolf, † * München 397
v. Maltzahn, Freifrau * Spandau 435
Mamlok, Isidor * Breslau 487
Mampe, Carl * Berlin 487
Mand, Carl * Koblenz 416. 453
Mannheim, Dr. * Berlin 407
Manzel, L. * Charlottenburg 397
March, Otto * Berlin . 398
Marckwald, Prof. Dr. W. * Berlin . . 366. 369. 422
Marcus, Otto * Berlin 393
v. Marées * München . 393
Marienberger Mosaikplattenfabrik * Marienberg i. S. . . 448. 465
Marmorwerke Balduinstein Guido Krebs * Balduinstein i. H.-N. . 454
Marquardt * Hohenheim in Württemberg 480
Marquart, Dr. L. C. * Beuel-Bonn a. Rh. . . 367. 369. 371. 372. 422
Martin, Theodor * Frankfurt a. M. 457

Page

Martini, Johannes * Berlin 393
Marx, Gustav * Düsseldorf 393
Maschinenfabrik Kempewerk * Nürnberg . . . 403
Mathildenhütte, Flussspatverkaufsverein * Harzburg 493
Mattes, Georg * München-Pasing 400
Mattes, Georg * Nürnberg 447
Matthies - Masuren * Halle a. S. 406
Matuschka-Greiffenklau, Guido Graf * Schloss Vollrads b. Winkel i. Rheingau 484
Mau * Dresden . 439. 449
Maucher, Rud. & Wilh. * Neustadt (Rhein-
Maurer, ... 484
pfalz) Prof. Dr. E. * Jena 375
Mauthe, Friedrich * Schwenningen a. N. 441. 455
May, Max * Hamburg 407
v. Mayenburg, Georg H. * Dresden . . . 390. 398
Mayer, Jacob * Frankenthal in Bayern (Rheinpfalz) 477
Mayer, Prof. Rudolf * Karlsruhe 400. 446
Mayerhoff, Franz & Co. * Berlin 423
Mayet, Prof. Dr. * Berlin 501
v. Max, Gabriel * München 393
Medizinalabteilung des Kgl. Preussischen Ministeriums der geistlichen, Unterrichts- u. Medizinalangelegenheiten * Berlin 379
Medizinalabteilung des Königl. Preussischen Kriegsministeriums * Berlin 379. 499
Medizinisches Warenhaus Akt.-Ges. * Berlin 378. 416. 473
Mehls, Hanna * Berlin 435
Meinhold (C. C.) & Söhne * Dresden 383. 385. 386
Meinhold, Gebrüder * Schweinsburg, Sachsen 465

Page

Meissner, P. * Magdeburg 451. 458
Meissner & Buch * Leipzig 404. 406
Meister, Gebr. * Berlin 441
Mengering, Gebrüder * Magdeburg . . . 451. 462
Mensing, A. * Berlin 373. 414
v. Menzel, Adolf * Berlin 393
Merck, E. * Darmstadt 367. 369 371. 372. 379. 423. 499
Merk, G. * München . 440
Merkel, Prof. Dr. * Göttingen 375
Merz, Karl * München 397
Merz, Otto * Ravensburg 455. 463
Messters Projektion * Berlin 380
Metall-Industrie Schönebeck, Akt.-Ges. * Schönebeck a. Elbe . . 473
Metallschlauch-Fabrik * Pforzheim 466
Metz, Otto, & Co. * Cöln a. Rh. 427
Meuschel sen., J. W. * Buchbrunn (Unterfranken) 485
Meydenbauer, Prof. Dr. * Berlin 364
Meyer, Carl (Gustav Prior) * Hannover . . 383. 387
Meyer, Prof. Dr. * Braunschweig . . 366. 370. 423
Meyer, Hans * Berlin 393. 396
Meyer, Kunz * München 393
v. Meyer, Prof. Dr. * Dresden 365. 423
Meyer & Kersting, Inhaber Heinrich Kersting * Karlsruhe i. B. 437
Meyer & Seitz * München 408
Meyerheim, Paul * Berlin 393
Meyerhoffer, Prof. Dr. * Berlin 366. 423
Meyn, Georg Ludwig * Berlin 393
Michaelis, Prof. Dr. * Rostock i. M. 366. 369. 423
Michel, Richard * Frankfurt a. O. 398
Micheli, Gebrüder * Berlin 479

Page

Mieth, Hugo * Berlin . 393
Miethe, Professor Dr. * Charlottenburg 364 370. 373. 406. 414. 423
v. Mikulicz-Radecki, Prof. Dr. * Breslau . 376
Milchwirtschaftliches Institut Hameln (Hannover) 479
Milde * Dresden . 439. 449
v. Miller, Prof. Friedrich * München . . . 439. 447
Minimax-Apparate-Bau-Gesellschaft * Berlin . 359. 417. 471
Ministerium des Innern * Karlsruhe 494
Mink, Valentin * Darmstadt 399
Missfeldt, Heinrich * Kiel 397
Mitscherlich, Prof. Dr. * Freiburg i. B. . 372. 423
Mittelbach, Robert * Göttingen 368. 423
Mitteldeutsche Gummiwarenfabrik, Louis Peter * Frankfurt a. M. 474
Mittler, E. S., & Sohn * Berlin 383
Möbius, Prof. Dr. * Berlin 374
Möckel, H. * Leipzig . 450
Moedebeck, H. W. L. * Graudenz 476
Möhlau, Prof. Dr. * Dresden 370. 423
Möhring, Bruno * Berlin 398. 401. 402. 445. 494
Möller, Hermann * Berlin 397
Möller, J. D. * Wedel i. Holst. 373. 414
Möller, Max * Aachen 407
Möller, Professor * Sonneberg 444
Möller, Prof. Dr. * Belzig 377. 378
Mohrbutter, Alfred * Kiel 393
Mohrbutter, Alfred * Schmargendorf b. Berlin 454
Mollenhauer, J., & Söhne * Fulda 416
Molling, A., & Co. * Hannover 404
Monjé, Paula * Düsseldorf 393

Page

Morawe, Ferdinand * Berlin 436
Morgenstern, E. * Breslau 384
Morgenstern, Ernst * Berlin 409
Motz, C. W., & Co. * Berlin-Schöneberg . . 437
Mucke, Alwin * Dresden 481
Mühlenbauanstalt und Maschinenfabrik vormals Gebrüder Seck * Dresden 481
Mühlig, Hugo * Düsseldorf 393
Müller, Dr., Geh. Ober-Reg.-Rat * Berlin . . 478
Müller, Albin * Magdeburg 401. 442. 450
Müller, C. * Berlin . . . 460
Müller, Egon * Schwarzhof b. Wiltingen 485
Müller, F. Ad., Söhne * Wiesbaden 380
Müller, Friedr. * München 406
Müller, Louis, & Co. * Biel (Schweiz) 432
Müller, Mart. * Blasewitz bei Dresden . . . 406
Müller, P. Johs., & Co. * Berlin-Charlottenburg 364. 386. 388
Müller, Richard * Dresden 393. 396
Müller, William * Berlin 398
Müller-Fröbelhaus, A. * Dresden-Wien 384
Müller-Münster, Franz * Berlin 393
Müller-Salem, Jul. * Pforzheim 402. 443. 446
Müller & Froebel * Sonneberg 444
Müller & Schmidt * Coburg 494
Müller-Schoenefeld * Berlin 393
Müller-Uri, Richard * Braunschweig . 373. 414
Münchener Verein für Luftschiffahrt 476
Muencke, Dr. Robert * Berlin 479
Münz, Bernhard * Nürnberg 437
Mundt, Ludwig * Ilmenrode a. Harz . . . 477

Page

Museum, Grossherzogliches * Darmstadt . . 374
Museum, Naturhistorisches: Bremen 374
Hamburg 374
Musikhaus zum Franz Liszt (R. Volkmann) * Weimar 410
Musik-Woche * Leipzig 411
Mutz, Hermann * Altona a. Elbe 402. 465

Nachtlicht, Leo * Berlin 451
Nägele, Erwin * Stuttgart 383. 385
Näter, H. * Magdeburg 451. 458
Nagel, Wilhelm * Karlsruhe 393
Nahrwold, Prof. Dr. * Berlin 388
Nassauischer Heilstättenverein für Lungenkranke 496
Nast, Ernst * Berlin . . 454
Naturalienkabinett, Kgl. * Stuttgart 374
Natura-Milchexportgesellschaft Bosch & Co. * Waren i. Meckl. . . 480. 482
Nauheim, Bad 494
Naumann, Prof. Dr. A. * Giessen 365. 423
Neelsen, E. * Berlin . . 434. 435
Neisser, Prof. Dr. * Breslau 376
Nemnich, O. * Wiesbaden 387
Neresheimer, Ludwig, & Co. * Hanau a. M. 431
Nernst, Prof. Dr. Walther * Göttingen . . . 365. 366. 368. 423
Neuberg, Dr. C. * Berlin 372
Neue Heilanstalt für Lungenkranke * Schömberg 497
Neue Tonwerke, Aug. Gundlach & Co. * Grossalmerode 493
Neumanns, August, Verlag, Fr. Lucas * Leipzig 383
Neumayer, Dr. Ludwig * München 380

Page

Neurobiologisches Universitätslaboratorium * Berlin 379
Neus, J. * Ober-Ingelheim a. Rh. 485
Niclou * Chemnitz . . . 406
Niedner, Dr. * Berlin . 377
Niehls, W. * Berlin . . 373. 414
Niemeyer, Adelbert, & Karl Bertsch * München 448
Niezky, Eduard * Düsseldorf 393
Nister, E. * Nürnberg 404. 406. 409. 465
Nitsche, Gustav * Darmstadt 452
Noack, Louis * Darmstadt 453. 465
Noelting, Prof. Dr. * Mülhausen im Elsass 370. 423
Nohn & Söhne * Waldhilbersheim b. Bingen a. Rh. 485
Norddeutsche Knappschaftspensionskasse * Halle a. S. 496
Norddeutscher Lloyd * Bremen 428. 475
Norddeutsche Torfmoorgesellschaft Triangel 480
Nordseemuseum Helgoland 374
Normal-Eichungs-Kommission * Charlottenburg 373. 414
North, Ferdinand * Erfurt 481
Noss & Lucas * Elberfeld 462

Obermayer, Hans * München 447. 463
Oberrealschule der Gemeinde Gross-Lichterfelde (Berlin) 386
Oberschlesischer Berg- und Hüttenmännischer Verein * Kattowitz . 492
Oberschlesischer Knappschaftsverein Tarnowitz 492. 493
Obrist, Hermann * München 436
Ochmann, Heinrich * Leipzig 408

Page

Oehler, K. * Offenbach a. M. 370. 371. 423
Oehmigkes, L., Verlag, R. Appelius * Berlin 383
Ölwerke Stern-Sonneborn, Akt.-Ges. * Hamburg 426
Oenike, Karl * Berlin . 396
Oertel, Louis * Hannover 410
Oesten, Paul * Berlin . 397
Oesterreich * Dresden 402. 449
v. Oettingen, Dr. W. * Steglitz 375
Offenburger Glasmosaikwerke * Offenburg (Baden) . . 446. 465
Offterdinger, Prof. * Hanau a. M. 431
Ohme, Hermann * Niedersalzbrunn i. Schl.. 465
Ohrenklinik der Kgl. Charité * Berlin . . . 379
Olbrich, Prof. Joseph M. * Darmstadt. 401. 451–453. 468.
Oldenbourg, Martin * Berlin 387. 408
Omeis, Dr. Th. * Würzburg 489
Opderbecke & Neese * Düsseldorf 361. 457
Oppler, Else * Berlin 451. 468
Orivit, Aktiengesellschaft für kunstgewerbliche Metallwarenfabrikation vorm. Rhein. Bronzegiesserei Ferd. Hub. Schmitz * Cöln a. Rh. . . . 439. 471
Orth, Prof. Dr. * Berlin 375
Orthopädisch-Chirurgische Klinik von Dr. Fopp und Dr. Eckstein * Berlin 380
Ortskrankenkasse für Leipzig u. Umgegend 501
Ortskrankenkasse Stuttgart 496
Ossmers * Ahausen . . 480
Ost, Prof. Dr. * Hannover . 366–369. 372. 423
Osterloh, Paul * Leipzig-Gautzsch 374
Ostertag, J. * Aalen (Württemberg) 460

Page

Ostpreussische Torfstreufabrik, A.-G. * Heydekrug 480
Ostwald, Prof. Dr. * Leipzig . . . 365. 368. 423
Ott & Co. * Hanau a. M. 431
Otto, Berthold * Gross-Lichterfelde 383

Paal, Prof. Dr. * Erlangen 366. 370. 371. 423
Paczka-Wagner, Frau Cornelia * Berlin . . . 433
Paetel, Hermann * Berlin 383. 387. 409
Pagels, Herm. Joachim * Berlin 397
Palis, Peter Georg, Inh. Carl Ramdohr Söhne * Magdeburg . . 451. 463
Palm, E. * Berlin 363
Pankok, Prof. B. * Stuttgart 402. 448. 455
Pape, William * Berlin 393
Papperitz, Georg * München 393
Parey, Paul * Berlin . 479
Passow, Prof. Dr. * Berlin 379
Patent-Flachswirkerei Cöln, Schönherr & Co. * Cöln a. Rh. 469
Pathologisch-Anatomische Anstalt des Städtischen Krankenhauses Moabit * Berlin 375
Pathologisches Institut der Kgl. Tierärztlichen Hochschule * München 378
Pathologisches Institut der Universität: Berlin 375
Breslau 375
Kiel 375
München 375
Pathologisches Institut des Städtischen Krankenhauses am Friedrichshain * Berlin . . 375
Pathologisches Institut des Städtischen Krankenhauses am Urban * Berlin 375
Pathologisches Institut des Städtischen Krankenhauses * Dresden 375
Patriotisches Institut der Frauenvereine für das Grossherzogtum Sachsen 496

Page

Patronenhülsenfabrik Bischweiler, Walbinger, Meuschel & Co. * Bischweiler i. Els. . . 490
Paul, Bruno * München 448
Paul & Miller * Magdeburg 451
Peiler, Marie Victoria * Berlin 434
Pensionskasse für die Arbeiter d. Preussisch-Hessischen Eisenbahngemeinschaft . . 496
Pepino, Anton * Dresden 393
Perkiewicz, M. * Ludwigsberg bei Moschin 465. 493
Perthes, Friedrich Andreas, Akt.-Ges. * Gotha 385
Perthes, Justus * Gotha 384. 411. 488
Pest, F. W. * Berlin . . 373. 423
Peter, J. L. * Mannheim 446. 458
Peters, C. F. * Leipzig 410. 450
Peters, Julius * Berlin 373. 414
v. Petersen, Hans * München 393
Petersen, Walter * Düsseldorf 393
Petersen-Angeln, Heinr. * Düsseldorf 393
Petersilie, Prof. Dr. * Berlin 388
Petzold, M. * Chemnitz 380
Pfaff, J. C. * Berlin . . 458
Pfann, Paul, & E. Pfeifer * München 398
Pfarr, Wilhelm * Sonneberg 444
Pfau, H., (Inhaber C. O. Liebig) * Berlin . . . 378
Pfeffer, Prof. Dr. * Leipzig 366. 423
Pfeifer, Felix * Leipzig 450
Pfeiffer, M. * München 440. 447
Pfister, Gebr. * München 447. 457
Pharmakologisches Institut der Universität Berlin 379
Philip, Maria * Berlin 435
Philippi, Peter * Düsseldorf 393

Page

Physikalisch-Technische Reichsanstalt * Charlottenburg 373. 414
Pichlers, A., Wwe. & Sohn * Wien and Leipzig . 383. 387
Pieperhoff, A. * Halle a.S. 406
Pietsch, Dr. * Berlin . . 501
Pietzsch, Martin * Dresden 398
Pietschmann, Ernst Max * Dresden 393. 396
Pinkau, Emil, & Co., Aktiengesellschaft * Leipzig 404
Pinner, Prof. Dr. * Berlin . . 365. 369. 371. 423
Piorkowski, Dr. * Berlin 378
Piper, Hermann * Dalldorf bei Berlin 388
Pippow, Gebr. * Hermsdorf (Mark) 386
Pirner & Franz * Dresden-A. 439. 449
Plato, Johannes * Berlin 396
Plaut & Zoellner * Berlin 469
Plessmann, Wilhelm * München 386
Podewils' Fabriken * Augsburg 379. 499
Poeckel, Dr. Heinrich * Berlin 365
Poeschel & Trepte * Leipzig 404. 408
Pohle, Hermann Emil * Düsseldorf 393
Polte * Magdeburg 471. 475
Pommerening, Lina * Berlin 386
Pommersche Eisengiesserei und Maschinenfabrik * Stralsund 490
Ponfick, Prof. Dr. * Breslau 375
Porzellanfabrik Markt-Redwitz, Jaeger & Co. * Markt-Redwitz in Bayern 464
Possin, Rudolf * Berlin 393
Prächtel, C. * Berlin . . 441. 449. 454. 455. 458. 460. 462. 463
Precht * Moorhausen b. Lilienthal (Hannover) 480
Preiser, H. * Liegnitz . 410
Pressler, Otto * Göttingen and Rauschewasser 498

Page

Pressler, Otto * Leipzig 415. 426
Preuss & Jünger * Breslau 383
Priebatschs Buchhandlung * Breslau 383
Probst & Boeker * Berlin 451. 458
Proessdorf, R. * Leipzig 407
Propheter, Otto * Karlsruhe 394
Protzen, Otto * Berlin. 396
Provinzialmuseum zu Altona 374
Provinzialverband d. Vaterländischen Frauenvereine der Provinz Sachsen 496
Pschorr, Dr. * Berlin . 371. 423
Pschorr, G. * München 488
Psychiatrische Klinik Giessen 380
Psychiatrische und Nervenklinik der Universität Kiel 380
Puls, Ed. * Berlin-Tempelhof 459
Pustet, Friedrich * Regensburg 409

Quantmeyer & Eicke * Berlin 378
Quitmann, Helene * Berlin 433

Raab, Doris * München 396
Raab, Jos. * Braunschweig 406
Rabeding, Fritz * München 394
Räuber, Prof. Wilhelm * München 394
Rahlenbeck, Otto * Berlin 445
Rahter, D. * Leipzig . . 410
Randhahn, Kurt * Bunzlau (Schlesien) and Eisenberg (S.-A.) . . . 402
Ranft, Arthur * Dresden 406
Rank, Franz, und Eduard Beyrer * München 398
Rank, Gebrüder * München 398. 401. 448
Raschig, Dr. F. * Ludwigshafen a. Rh. 370. 424
Rat der Stadt:
Chemnitz 503
Dresden 497. 503
Leipzig 495

Page

Rathenower Lungenheilstättenverein 496
Rathke, Alb. * Magdeburg 410
Raupp, Erwin * Dresden 394. 406
Rautenstrauch, Frau W. * Karthäuserhof bei Eitelsbach 485
Realgymnasium * Altona 386
Regina-Bogenlampenfabrik * Cöln a. Rh. . . 359–361. 472
Rehder, Julius * Hamburg 394
v. Reichenbach, Graf Woldemar * Dresden 394
Reichsdruckerei * Berlin 402. 404. 410. 427
Reichs-Versicherungsamt * Berlin 501
Reifferscheid, Heinrich * München 396
Reim, Otto * Berlin . . 396
Reimer, Dietrich (Ernst Vohsen) * Berlin . . . 410. 411. 489
Reinecke, Gebrüder * Leipzig 410
Reinemann, Paul * Nürnberg 488
Reinhard, Eugenie * Berlin 455. 462. 468
Reinhart, Josef * Gross-Lichterfelde 404
Reinke, Prof. Dr. * Braunschweig . . 372. 373. 424
Reiss, Neumann & Gansereit * Berlin 443. 451
Reissert, Prof. Dr. * Marburg 424
Reitmayer, Ph. * Mainz 443. 452. 453
Reit- und Fahrschule Elmshorn 479
Remscheider Sägen- und Werkzeugfabrik J. D. Dominicus & Söhne * Remscheid-Vieringhausen 490
Rengersche Buchhandlung, Gebhardt & Willisch * Leipzig 383. 384
Rentsch, F. * Leipzig . 450. 468
Reps & Trinte * Magdeburg 451. 465
Rheinart, Adolf * Saarburg 485

Page

Richter, Aug. E. * Hamburg 432
Richter, C. * Berlin 373. 414
Richter, Direktor * Lipine 407
Richter, E. Ad., & Co. * Rudolstadt 416. 445. 459
Richter & Co. * Mülheim a. d. Mosel 485
Riebel * Eberswalde . . 490
Riedel, Frl. * Darmstadt 452
Riedel, Guido * Einsiedel-Chemnitz 481
Riedel, J. D. * Berlin . 416
Riedinger, A. * Augsburg 373
Riefler, Clemens * München 373. 414
Riegel, Georg * Nürnberg 457
Riemerschmid, Richard * München 436. 448
Rieter-Biedermann, J. * Leipzig 450
Rieth, Prof. Otto * Berlin. 398
Rietschel & Henneberg * Berlin-Dresden 378. 379. 497. 499
Rimbach, Prof. Dr. * Bonn 365. 424
Ripberger, Clara * Dresden 468
Ritter, Caspar * Karlsruhe 394
Rittershausen, E. * Berlin 416
Rixdorfer Linoleumfabrik * Rixdorf b. Berlin 450
Rochlitz, C. F. * Berlin 362. 441
Rocholl, Theodor * Düsseldorf 394
Röchling, Carl * Berlin 394
Röder, Carl, Hofmundbäcker * Dresden . 482
Roeder, Carl, Dresden 397
Roeder, Guido, & Co. * Ansbach in Bayern . . 463
Roederer & Cie., Longeville 485
Röhlich, Gebrüder * Berlin 361. 459
Rohde, Dr. * München 371. 424
Rohloff, Prof. Otto * Berlin . . . 361. 441. 443
Rosbacher natürliches Mineraltafelwasser * Quellen bei Homburg 494

Page

Rosenberg, Th. * Berlin 373. 424
Rosenheim, Dr. * Berlin 366. 424
Rosenstiel, Fr. * Berlin 432. 433
Rosenthal, Jacques * München 365. 424
Rosenthal, Ph., & Co., A.-G. * Selb i. Bayern 465
Rossbach, Max * Solln bei München . . 360. 457
Rossbergsche Verlagsbuchhandlung * Leipzig 383
Roth, Emil * Giessen. . 383. 384
Roubaud, Franz * München 394
Rozsavölgyi & Co. * Budapest 410
Rudhardsche Giesserei * Offenbach a. M. 404. 408
Rudolph, Bernhard * Stuttgart 400. 455
Rudolph, Hugo * Walddorf i. S. 466
Rüben- und Getreidesamenzüchterei Rittergut Aderstedt-Gunsleben, Bezirk Magdeburg 477
Rühle, Carl * Leipzig . 410
v. Ruemann, Prof. W. * München 360. 400
Ruess, M. * Ulm 388
Ruf, C. * Freiburg i. B. 406
Ruff, Prof. Dr. Otto * Berlin 366–368. 372. 424
Ruhstrat, Gebr. * Göttingen 368. 424
Rumbler * Wiesbaden 406
Rummelspacher, Prof. Josef * Berlin. 457. 506
Rumpel, Dr. * Hamburg 375
Ruthe, Wilhelm * Wiesbaden 485

Saalburger Marmorwerk Rödel & Co. * Saalburg a. S. 450
Saarbrücken, Kreis . . . 496
Saarbrücker Knappschaftsverein * Saarbrücken 492
Sachs, Dr. * Berlin 369. 424
Sachsenberg, Gebrüder * Rosslau in Anhalt . 428

Page

Sachsenweger, J. * Hanau a. M. 431
Sachsse, E., & Co. * Leipzig 372. 424
Sächsische Kunstweberei Claviez, Aktiengesellschaft * Adorf i. S. 463
Sächsische Reisszeugfabrik F. E. Hertel & Co. 437
Sahlmann, Anton * Fürth 488
Saile, Val. * Stuttgart 456. 460
Saline Lüneburg * Lüneburg 482
Salkowski, Prof. Dr. * Berlin 424
Salkowski, Prof. Dr. * Münster i. W. 370. 372. 424
Salomon, Dr. * Berlin 489
Samhammer, Philipp, & Co. * Sonneberg . . . 444
Sanatorium Wehrawald 497
Sander, Dr., und Dr. Maier * St. Blasien im bad. Schwarzwald . . 497
Sander, Theodor * Berlin 396
Sanitätsverband für München und Umgebung 496
Sapatka, Else * München 436
Sartorius, F. * Göttingen 367. 368. 415. 424. 426. 498
Sauer, Dr. * Berlin . . 489
Sauerbier, Franz * Berlin 474
Saupe, Gertrud * Berlin 407
Schaefer, Maximilian * Berlin 394
Schaefer, Philipp Otto * München . 359. 394. 457
Schäfer, Ludwig * Mainz 441. 452. 453. 459. 460. 463
Schäffer & Budenberg * Magdeburg-Buckau 373. 414. 470. 471
Schaeffer & Walcker * Berlin 506
Schafstein & Co. * Cöln a. Rh. 408
Schahl, Paul * Berlin . 386
Schanze, M. * Leipzig 379. 415. 499
Scharf, Otto * Crefeld . 407
Scharren, Ed., & Co. * Cannstatt 488

Page

Scharvogel, J. J. * München 402. 436. 447. 448. 465
Schatt, Gebrüder * Hanau a. M. 431
Schatz, Ernst * Breslau 407
Schauss, Martin * Berlin 397
Scheer, Otto * Berlin 443. 451
Scheffer, Dr. Theodor * Leipzig 383
Scheibert, M. & H. * Berlin 379
Schellbach, Elisabeth * Friedelshof b. Königs-Wusterhausen 435
Schelter, J. G., & Giesecke * Leipzig 404
v. Schenckendorff, Freiherr * Görlitz 387
Scherer, Georg, & Co. * Langen b. Frankfurt a. M. 486–488
Scherf, Karl * Limbach i. S. 469
Scherf, Walter, & Co. * Nürnberg 439. 443
Scheunert, Arno * Leipzig 405
Scheurenberg, Prof. Joseph * Berlin 394
Schiedmayer * Stuttgart 417. 456
Schiffel, Frl. * Darmstadt 452
Schiffs- und Maschinenbau-Aktiengesellschaft * Mannheim . 428
Schilling, E. M. * Sonneberg 444
Schilling, Johannes * Dresden 397
Schillings, C. G. * Gürzeneck-Düren . . 411. 489
Schiltsky * Berlin . . . 375
Schimmel, Oskar, & Co., A.-G. * Chemnitz . . . 500
Schindler, Osmar * Dresden 394
Schippel, Frl. * Darmstadt 453
Schirm, C. C. * Grunewald b. Berlin . . 439. 455
Schirmer, Robert * Berlin 400. 457
Schirmer, Blau & Co. * Berlin N. 466
Schlee, Otto * Bieberach a. Riss (Württbg.) . . 460

Page

Schleich, Ed. * München 394
Schleinitz, Richard * Dresden 398
Schleissner, J. D., Söhne * Hanau a. M. 431
Schlesingersche Buch- und Musikhandlung * Berlin 410
Schleusing, Carl * Schöneberg bei Berlin 400
Schlichting, Max * Berlin 394
Schlieder, Sophie Louise * Berlin 434. 435
Schlüter, H. * Neustadt am Rübenberg, Prov. Hannover 471
Schlumprecht, Heinrich * München . . . 396
Schmaltz, Friedrich * Offenbach a. M. 471
Schmarje, Walther * Schmargendorf b. Berlin 400. 451
Schmeidl, Jos. * München 443
Schmey, G., Nachfolger * Sonneberg 444
Schmid, Prof. Adolf * Pforzheim 400. 439. 446
Schmid, Mathias * München 394. 506
Schmid-Göringer, Frau Rose 506
Schmid-Pecht, Elisabeth * Konstanz 402. 447
Schmidt, Dr., Geh. Ober-Reg.-Rat * Berlin . . 363
Schmidt, C. F. * Heilbronn a. N. 410
Schmidt, Dr. J. A. * Bonn a. Rh. 387
Schmidt, Rich. * Darmstadt 399
Schmidt, W. * Giessen 368. 424
v. Schmidt, Freiherr Heinrich * München. . . . 398
Schmidt-Kestner, Erich * Berlin 397
Schmidt, Franz, & Haensch * Berlin 366. 373. 376. 414. 415. 424. 426. 498
Schmidt, Otto & Aug. * Kreuznach, Rheinland 485
Schmiedt, Heinrich * München 443
Schmits, A. * Düsseldorf 443. 449

Page

Schmitt, Georg Friedr. * Nürnberg 443
Schmitz, Emil * Düsseldorf 360
Schmitz, Max * Leipzig 410
Schmitzberger, Josef * München 394
Schmorl, Prof. Dr. * Dresden 375
Schmuz-Baudiss, Theo * Charlottenburg . 402. 436
Schnars-Alquist, Hugo * Hamburg 394
Schneckendorf, Joseph * München 440. 447
Schnee, Hermann * Berlin 394
Schnetter, Moritz * Berlin 383
Schnittspahn, Frl. * Darmstadt 453
Schoening, Carl, Aktiengesellschaft * Berlin-Reinickendorf 460
Schoenner, G. * Nürnberg 374. 414
Schönau, Arthur * Sonneberg 444
Schönfeld jun., Ernst * Hanau a. M. 431
Schönleber, Prof. G. * Karlsruhe . 394. 399. 453
Schöpflich, Eduard * München 440
Schoetz, Richard * Berlin 387
Scholl, Eduard, Nachfolger * Karlsruhe und Durlach 402. 446
Scholl, Prof. Dr. * Karlsruhe i. B. 369. 424
Scholl & Hillebrand * Rüdesheim a. Rh. . . . 485
Scholz, Richard * München 394
Schopper, Louis * Leipzig 374. 414
Schoppmeyer, Ansgar * Schöneberg bei Berlin 399. 405
Schoppmeyer, C. * Magdeburg 451. 459
v. Schorlemersche, Freiherrlich, Renteiverwaltung * Trier a. d. Mosel 485
Schott, Walter * Berlin 397
Schott und Genossen * Jena 366. 374. 414. 424. 426. 498

Page

Schotte, Ernst, & Co. * Berlin 384
Schottlaender, L., & Co. * Berlin 410
Schotts, B. Söhne * Mainz 408
Schottstedt, W. * Magdeburg 451. 459
Schrader, Bertha * Dresden 433
Schraegle, Gustav * Frankfurt a. M. 394
Schreiber, J. F. * Esslingen bei Stuttgart . . 383. 384. 386
Schreyer, Adolf * Cronberg i. T. 394
Schreyer, H. * Leipzig 450. 460
Schreyer, Wilhelm * Düsseldorf 394
Schreyögg, Georg * München 397
Schröder, Albert * München 394
Schroeder, H., Nachf. * Berlin 410
Schröder, Walther * Berlin 410
Schröter, Bernhard * Meissen 394
v. Schubert * Grünhaus bei Trier 486
Schuberth, jun., Fritz * Leipzig 410
Schuberth, J., & Co. * Leipzig 410
Schuch, Werner * Berlin 394
Schuchardt, Dr. Theodor * Görlitz (Schlesien) 367. 369. 371. 424
Schülerwerkstatt * Leipzig 388
Schüssler, Hedwig * Berlin 407
Schütte-Kessel-Konsortium * Bremerhaven 470. 475
Schütz, F. A. * Leipzig 450. 459
Schütze, Ilse * Charlottenburg. 434. 435
Schuler, J. A. * Mainz 452. 453. 460
Schulhaus-Verlag * Berlin-Tempelhof 383
Schultz, Prof. Dr. * München 370. 424
Schultz, Otto * Berlin . 443
Schultz, Wilhelm * Berlin 410

Page

Schultze, G. A. * Berlin 374. 414
Schultze, Hendrick & Carl * Düsseldorf. . 449. 463
Schulz, Arthur * Berlin 457. 490
Schulz, Fritz, jun., Akt.-Ges. * Leipzig 426
Schulz, Helene * Berlin 361. 457
Schulz & Holdefleiss * Berlin 360. 362. 455. 457. 460
Schulze, Gustav, & Jost * Berlin 460
Schumacher, Emil * Bielefeld 362. 466
Schumacher, Fritz * Dresden 398. 401
Schumann, F. A. * Berlin 362. 465. 466
Schumann u. Co., Glashütte i. S. 415
Schuster & Löffler * Berlin 408. 411
Schuster-Woldan, Raffael * München 394
Schwarz, Albert * Ravensburg (Württemberg) 468
Schwarz, Hermann * Magdeburg 431
Schwarz, Rudolf * München 402. 447
Schweers & Haake * Bremen 411
v. Schwerin-Löwitz, Graf * Löwitz (Kreis Anklam) 480
Sedlmayr, Gabriel, Brauerei zum Spaten * München 488
Sedlmayr, Jos., Brauerei zum Franziskanerkeller (Leistbräu) * München 488
Seebeck, G., A.-G. * Bremerhaven 475
See-Berufsgenossenschaft * Hamburg . . 501
Seeger, Hermann * Berlin 394
Seel, Adolf * Düsseldorf 394
Seemanns, E. A., Verlag * Leipzig . 384. 386. 408
Seewald, E. * Arnswalde 480
Seffner, Carl * Leipzig 397
Seibert, W. & H * Wetzlar und Berlin. . 415. 500

Page

Seidel, Rudolph * Grüngräbchen b. Schwepnitz i. S. 362
Seidenberger, M., Söhne * Nürnberg 488
Seidl, Emanuel * München 399. 401
v. Seidl, Gabriel * München 399
Seidler, Hermann * Konstanz 402
v. Seidlitz, Dr. * Ebenhausen (Oberbayern). 475
Seifert * Berlin 377
Seifert, R. A. * Dresden 453. 460
Seiler, Johannes * München 439
Seliger, Prof. Max * Leipzig 399. 450
Selke, Photosculpt-Ges. * Berlin 406
Senf, Richard * München 399
Senff, Barthold * Leipzig 411. 450
Serumgesellschaft * Berlin 500
Seydel, Hans * Berlin 396
Seyffarth, Fr. und E. * Magdeburg 444. 451
Shannon-Registrator-Co. (August Zeiss & Co.) * Berlin 359. 360. 459
Sichel, H., Söhne * Mainz a. Rh. 485
Siebert, Dr., & Kühn * Kassel 374. 415
Siegels, C. F. W., Musikh. (R. Linnemann) * Leipzig 411
Siegfried, Prof. Dr. * Leipzig . . 371. 372. 424
Siegismund, Karl * Berlin 383
Sieke, K. * Rendsburg 387
Siemenroth, Franz * Berlin 383. 388
Siemens & Halske * Berlin 374. 376. 379. 415. 428 473. 500
Siemens-Schuckertwerke * Berlin 362. 428. 472. 475
Siemssen * Augsburg . 406
Sieveking, Dr. G. * Hamburg 407
Silbermann, A. * Berlin 472

Page

Silberstein, Dr. Ernst * Berlin 378
Simm, Franz * München 394
Simon, August * Berlin 455. 459
Simon, S. * Berlin . . . 498
Simrock, N. * Berlin . . 411
Simundt, Percy * Berlin 376
Singer, Johannes * Plauen i. V. 467
Sittenfeld, Julius * Berlin 408
Sittmann, Carl * Oppenheim a. Rh. 486
v. Sivers, Clara * Halensee b. Berlin . . 434. 435
Skarbina, Franz * Berlin 394
Sobernheim, Prof. Dr. * Halle a. S. 378
Sobotta, L. * Berlin . . 457
Soehnlein & Co. * Schierstein a. Rh. 486
Solf & Wichards * Berlin 399
Sommer & Runge * Berlin 374. 415
Spalding & Grenander * Berlin 401
Spamer, Otto * Leipzig 383. 410
Speidel, Friedrich * Pforzheim 440
Spengler, Franz * Berlin 361. 460
Spielmann, Casimir * Stuttgart 482
Spindler, Carl * St. Leonhardt bei Börsch (Unterelsass). 454
Spindler, Georg, jun. * Sonneberg 444
Spindler, Luise * St. Leonhardt (Unterelsass) . . 454. 463. 468
Spiro, Eugen * Breslau 394
Spitzweg, K. * München 394
Spoerhase, W. * Giessen 374. 415. 490
Springer, Julius * Berlin 387. 497. 498
Staatliches Hygienisches Institut * Hamburg 379. 499
Stadtbrauerei Blankenhain in Thüringen * Akt.-Ges. 488

Page

Stadtgemeinde München 496
Stadt Leipzig 504
Stadtmagistrat: Fürth . 495
Nürnberg 504
Würzburg 505
Stadtrat der Stadt Bautzen 502
Stadtschultheissenamt Stuttgart 505
Staedel, Prof. Dr. * Darmstadt 366. 424
Städtische Friedrich-Werdersche Oberrealschule * Berlin 386
Städtische gewerbliche Fortbildungsschule, weibliche Abteilung * Stuttgart . . . 402. 456
Städtische Handelshochschule * Cöln a. Rh. 364
Städtische Hilfsschule für schwachbegabte Kinder * Stolp i. P. . . 388
Städtische Idiotenanstalt Berlin-Dalldorf . 381
Städtische Oberrealschule * Bochum 380. 386
Städtische X. Realschule * Berlin 386
Städtische II. Realschule * Berlin 380
Städtische Realschule: Erfurt 386
Kreuznach 380
Städtische Sophien-Schule * Hannover . . 381
Städtische Taubstummenerziehungsanstalt * Frankfurt a. M. . . . 381
Städtische Verwaltung: Barmen 381. 500
Bautzen 500
Berlin 381. 500
Bielefeld 381
Bochum 381
Bonn 500
Breslau 381. 500
Bromberg 500
Charlottenburg 381
Chemnitz 381
Cöln a. Rh. 500
Darmstadt 381
Dortmund 500
Dresden 381. 500
Düsseldorf 381
Eisleben 381
Elberfeld 381
Frankfurt a. M. 381. 500
Halle a. S. 500

Page

Hamburg 381
Hannover 381
Hildesheim 381
Hörde 381
Kassel 381. 500
Kiel 500
Königsberg i. Pr. . . . 381
Kottbus 500
Kreuznach 381
Leipzig 381. 500
Mainz 381
München 381. 500
Nürnberg 381
Posen 381
Quedlinburg 381
Stettin 381
Stolp 381
Strassburg i. E. 381. 500
Stuttgart 381
Wiesbaden 500
Würzburg 500
Städtisches Goethe-Gymnasium * Frankfurt a. M. 380
Städtisches Gymnasium * Stettin 386
Städtisches Realgymnasium: Barmen 380
Elberfeld 380
Iserlohn 386
Städtisches Realgymnasium "Musterschule" * Frankfurt a. M. 380. 386
Stahl, H. * Magdeburg 451. 459
Stalling, Gerhard * Oldenburg i. G. 383. 405. 406
Stange & Wagner * Berlin 506
Stankiewicz, P. * Berlin 384
Starck, Constantin * Berlin 397
Stargardt, J. A. * Berlin 408
Stassfurter Chem. Fabrik, A.-G. * Stassfurt 425
Stassfurter Chemische Fabriken vorm. Vorster & Grünberg * Stassfurt 367
Statistisches Amt der Stadt Dresden 495. 497. 500
Staude, Elwin * Berlin 383. 387
Staudinger, A. * München 460
Stavenhagen, Prof. Dr. * Berlin-Grunewald . 367. 425

Page

Stechow, Gertrud * Berlin-Friedenau . . . 433
Steger, J. * Leipzig . . 375
Steidel, E. * Berlin . . 407
Steiff, Margarete * Giengenbrenz 445
Steiger, O. * Leutewitz (Königr. Sachsen) . . . 477
Steigerwalds, Franz, Neffe * München 465. 466
Steinhäuser, Fr. * Hemleben i. Th. . . . 451. 463
Steinhausen, Wilhelm * Frankfurt a. M. 396
Steinheuer & Co. * Hanau a. M. 431
Steinicken & Lohr * München 439. 447
Stein & Köster * Mainz 488
Stephan, Emilie * Karlsruhe 399. 454
Sterl, Robert * Dresden 394
Stettiner Maschinenbau Akt.-Ges. "Vulcan" * Stettin-Bredow 470
Stichling, O. * Berlin . 444
Stiller, A. E., & Sohn * Seifersdorf b. Sorau, N.-L. 467
Stock, Dr. * Berlin . . . 366. 367. 425
Stocker, Daniel * Stuttgart 400. 456
Stoedtner, Dr. Franz * Berlin 359. 406
Stoehr, Prof. Dr. * Kiel 371. 425
Stoermer, Prof. Dr. * Rostock i. M. . . 370. 425
Stoeving, Curt * Berlin 455
Stotz, Paul * Stuttgart 444. 456
Strassburger Druckerei und Verlagsanstalt, vorm. R. Schultz & Co. * Strassburg i. E. . . 383
Strauch, Eduard * Leipzig 387
Strauss, S., Söhne * Frankfurt a. M. 486
Strenge, Otto * Elisabeth-Fehn 480
Strich-Chapell, Walter * Karlsruhe 399. 454
Strobel, Konrad * München 396
Stromeyer, Helene * Karlsruhe 399. 454

Page

Stroucken, H. * Crefeld 459
Struck, Hermann * Berlin 396
Strübe, Hermann * Karlsruhe 401
Strützel, Otto * München 394
Studiengesellschaft für elektrische Schnellbahnen * Berlin . . . 474
Stückrath, P. * Friedenau b. Berlin . 374. 415
Sturm, Paul * Leipzig 401. 450
Stuttgarter Möbelfabrik Georg Schöttle * Stuttgart 456. 459
Süddeutsche Heilanstalt für Lungenkranke * Schömberg 497
Süddeutsche Lüsterfabrik * München 447. 460
Süddeutscher Musikverlag * Strassburg i. E. 411
Süss, Paul, A.-G. 437
Sulzbach, W. * Berlin 411
Sy & Wagner * Berlin 440
Sylter Haus-Fleissverein * Berlin 434

Taschner, Professor Ignatius * München . . 436
Tauchnitz, Chr. Herm. * Leipzig 498
Tecklenborg, Joh. C., A.-G. * Bremerhaven-Geestemünde 475
Teltow, Kreis 428
Tesdorpf, L. * Stuttgart 374. 415
Teubner, B. G. * Leipzig 386. 387. 408. 410
Theresienthaler Kristallglasfabriks-Niederlage, Eduard Rau * München 466
Thermophorgesellschaft * Berlin 378
Theuerkorn, Paul * München 396
Thiele, Prof. Dr. * Strassburg 369. 425
Thiele & Steinert * Berlin 361. 468
Thienemann, E. F. * Gotha 387

Page

Thienhaus, Rudolf * Berlin 396
Thierfelder, Prof. Dr. * Berlin 372. 425
Thoms, Prof. Dr. * Steglitz-Berlin 372. 425
Thonet, Gebrüder * Berlin 362. 459
Thor, Walter * München 394
Thorner, Dr. Walther * Berlin 380
Thüringische Landesversicherungsanstalt * Weimar 496. 501
Thyriot, Franz * Berlin 399
Tiedemann, Carl * Dresden 432
Tierärztliche Abteilung des Königl. Württembergischen Medizinalkollegiums * Stuttgart 500
Tierphysiolog. Instit. d. landwirtschaftl. Akademie * Bonn-Poppelsdorf 489
Timmel, Ernst, & Co. * Plauen i. V. 467
v. Tippelskirch & Co. * Berlin 489. 490
Toepfer, Otto, & Sohn * Potsdam 374. 415
Tolksdorf, B. * Berlin . 480
Tollens, Prof. Dr. * Göttingen . . . 372. 373. 425
Tonwerke Kandern * Kandern 446. 465
Tonwerk Schippach bei Klingenberg a. Main (Bayern) 493
Trarbach Nachf. * Berlin 486
Traube, Prof. Dr. * Berlin 369. 425
Traun, Dr. Heinrich, & Söhne, vorm. Harburger Gummikamm-Co. * Hamburg 489
Tröltsch & Hanselmann * Weissenburg am Sand (Bayern) . 361. 468
Troponwerke * Mülheim-Rhein 480
Trowitzsch & Sohn * Frankfurt a. O. 405
Trüller, Harry * Celle . 482
Türkische Zigaretten- u. Tabakfabrik "Sultan" * Breslau 480
Typke, Carl * Berlin 360. 466

Page

Udluft & Hartmann * Dresden 449. 459
v. Uechtritz, Professor Kuno * Berlin . 362. 444
Uihlein, Heinrich * Hannover 461. 463
Ulbrich, Prof. Dr. * Berlin 388
Ule, Karl * München . 460
Underberg-Albrecht, H. * Rheinberg am Niederrhein 487
Unger, August * Berlin 361. 362. 457
Unger, Hans * Dresden 394
Ungewitter, Hugo * Düsseldorf 394
Universität Marburg . . 364
Universitätsaugenklinik * Breslau . . . 380
Universitätsklinik für Hautkrankheiten * Breslau 376
Universitäts-Poliklinik für orthopädische Chirurgie * Berlin 376
Untersuchungslaboratorium (Nahrungsmittel), Kaiserl. Gesundheitsamt * Berlin 488. 497
Urff, S. * Hanau 407
Uth, Max * Berlin . . . 394

Vahlen, Franz * Berlin. 383
Valckenberg, P. W. Franz * Worms a. Rh. 486
Vandenhoeck und Ruprecht * Göttingen . . 498
v. Vangerow, L. * Bremerhaven 383
Vanvolxens, Gustav * Trier a. d. Mosel . . . 486
Vaterländischer Frauenverein zu Kassel . . . 496
Velhagen & Klasing * Bielefeld und Leipzig 384. 387. 408. 410. 411
Verband der Pferdezüchter in den Holsteinischen Marschen 489
Verband der Züchter des Oldenburger eleganten schweren Kutschpferdes 489
Verband zur Errichtung von Volksheilstätten für Lungenkranke im Regierungsbezirk Koblenz 496
Verein der deutschen Musikalienhändler * Leipzig 410
Verein der Künstlerinnen und Kunstfreundinnen * Berlin 393. 400. 401. 438. 440. 441. 456. 457. 461. 467
Verein für die bergbaulichen Interessen im Oberbergamtsbezirk Dortmund 491
Verein für die bergbaulichen Interessen, Sitz Essen 492
Verein für Volksheilstätten in Ober-Bayern . 496
Verein für Volksheilstätten in der Pfalz . 496
Verein für Volksheilstätten in Württemberg . 496
Vereinigte Chemische Werke * Charlottenburg 372. 425. 426
Vereinigte Eisenacher Brauereien, Petersberger und Schlossbrauerei, Akt.-Ges. * Eisenach i. Thür. . . . 488
Vereinigte Fabriken für Laboratoriumsbedarf * Berlin 365–368. 371–373. 425. 426. 489. 498
Vereinigte Glanzstofffabriken, A.-G. * Elberfeld 427. 467
Vereinigte Königlich Preussische u. Grossherzoglich Hessische Staatseisenbahnverwaltung * Berlin 416. 473
Vereinigte Maschinenfabrik Augsburg * Gustavsburg 428
Vereinigte Pfeifenfabriken vorm. Gebh. Ott & Ziener und Ellenberger, A.-G. * Nürnberg 432
Vereinigte Tonwarenwerke, A.-G. * Charlottenburg 425
Verein. Werkstätten für Kunst im Handwerk * München 400. 401. 438. 440. 441. 448. 459. 465
Vereinigte Württembergische Werkstätten für Kunst im Handwerk * Stuttgart 457
Vereinigung der Kunstfreunde * Berlin 405. 406
Verein zum Heinrich-Hospital 496
Verein zur Begründung von Volksheilstätten im Königreich Sachsen 496
Verein zur Förderung der Moorkultur im Deutschen Reich * Friedenau 480
Verein zur Förderung des Wohls der arbeitenden Klassen im Kreise Waldenburg i. Schles.. 492
Verein zur Gründung eines Sanatoriums für unbemittelte Lungenkranke in Unterfranken 496
Verlag des Deutschen Reichs-Adressbuchs * Berlin 411
Verlagsanstalt F. Bruckmann, A.-G. * München 406. 408. 411
Verlag von Wilhelm Ernst & Sohn * Berlin . . . 497
Verwiebe, Hermann * Pankow 361. 457
Věšin, Jacoslav Franz Julius * München . . 395
Vesler & Schoch * Leipzig 472
Vieweg, Chr. Fr. * Berlin 411
Vieweg, Friedr., & Sohn * Braunschweig . . . 384. 405. 408. 411. 498
Villeroy & Boch * Mettlach (Rheinpreussen) 360. 361. 449. 465
Vogel, Hermann * Dresden 396
Vogel, Hugo * Berlin . 395
Vogel, Wilhelm * Chemnitz 359. 361. 463
Vogeler, Heinrich * Worpswede 395
Vogtländische Musikinstrumenten-Fabrik Hermann Dölling jun. * Markneukirchen i. S. 417
Voigt, Hugo * Leipzig . 479
Voigt, Wilhelm * Berlin 455. 459

Page

Voigtländers, R., Verlagsbuchhandlung * Leipzig 384. 386. 388. 408
Volckmar, F. * Leipzig 360. 411
Volkmann, Artur * Leipzig 401. 450
v. Volkmann, Prof. Hans * Karlsruhe . . 399. 453
Volksdorf, B. * Berlin 480
Volksheilstättenverein vom Roten Kreuz in Berlin 496. 501
Vollbehr, Ernst * St. Heinrich am Starnberger See, Bayern . . 402
Vollgold, D., & Sohn * Berlin 440
Volz, Prof. * Karlsruhe 401. 454
Vongerichten, Prof. Dr. * Jena 372. 425
Vorberg, Margarete * Bugeshalde bei Neu-Babelsberg 435
Vordermayer, Ludwig * Berlin 397
Voretzsch, Felix Reinhold * Dresden 399
Vorgang, Paul * Berlin 395
Voss, Leopold * Hamburg 365. 384. 388
Vries, Henry * Cöln a. Rh. 411

Wachsmuth, F. C. * Leipzig 386. 387
Wadere, Heinrich * München 397
Wächtersbacher Steingutfabrik, Abteilung Chr. Neureuther * Schillerbach bei Wächtersbach (Bayern) . . 465
Wagemann, Gebrüder * Wiesbaden 486
Wagner, Günther * Hannover 387
Wagner, H., & C. Debes * Leipzig 385
Waisenhauses, Buchhandlung des, in Halle a. S. 384. 387. 388
Waldau, Grete * Berlin 363. 399
Wallach, Prof. Dr. * Göttingen 365. 366. 370. 425
Wandschneider, Wilh. * Berlin 398

Page

v. Wangenheim, Freiherr * Klein-Spiegel bei Grossmellen (Pomm.) 480
Wanschaff, J. * Berlin 374. 415
Warthmüller, R. * Berlin 395
Wasmuth, Ernst * Berlin 405. 406. 411
Weber, H. & J. * Darmstadt 393
Weber, J. J. * Leipzig 388. 405. 408. 411
Weber, R. * Haynau i. Schl. 490
Weber-Falckenberg * Berlin 362. 427
Wedekind, Dr. * Tübingen 365. 367. 369. 372. 425
Wedekind, R., & Co. * Ürdingen a. Rh. 370. 425
Welcker, Dr. * Görbersdorf. 497
Weidmannsche Buchhandlung * Berlin 384. 388
Weigel, Else * München 436
Weimer, Wilh. * Darmstadt 406
Weindler, Wilhelm, & Co. * Plauen i. V. 467
Weingärtner, Ed. * Leipzig-Lindenau 407
Weinland, Prof. Dr. * Tübingen 367. 425
Weinzierl, F. * München 402
Weiss, Julius * Berlin 411
Weiss, W. * Karlsruhe 444. 446
Welte, Bertha * Karlsruhe 399. 454
Welte, M., & Söhne * Freiburg (Baden) . . . 417. 446. 450
Wenck, Ernst * Berlin 398
Wendling, Carl * Berlin 395
Wendling, Gustav * Düsseldorf 395
Wenglein, Josef * München 395
Wenig, Bernhard * Hanau a. M. 431
Werkstätten der Kunstgewerbeschule, Keramik * Magdeburg 402. 465
Werkstätten der Kunstgewerbeschule, Lithographie * Magdeburg 393. 411. 451
Werkstätten f. deutschen Hausrat * Dresden 449. 459
Werkstätten für Wohnungseinrichtungen * München 448. 459

Page

v. Werner, A. * Berlin 395
Werner, Gustav * Leipzig 406
Werner, J. H. * Berlin 361. 439. 440
Werner, Selmar * Dresden 398
Werner & Winter * Frankfurt a. M. 374
Werren, Otto * Kreuznach a. d. Nahe 486
Wessels Wandplattenfabrik * Bonn 465
Westendorp, Fritz * Düsseldorf 395
Westermann, George * Braunschweig . . 384. 385
Westfälische Bergwerkschaftskasse * Bochum 491
Westphal & Reinhold * Berlin 378
Westphalen, August * Kiel 395
Westphalen, Propeller-Gesellschaft * Berlin 475
Westpreussisch. Fischereiverein * Danzig . 480
Westpreussisch. Provinzialmuseum * Danzig 480
Wichelhaus, Prof. Dr. * Berlin . . . 366. 370. 425
Wichgraf, Fritz * Berlin 395
Wickenhagen, Prof. * Schöneberg (Berlin) . 387
Wiedemann, Gebr. * Wangen im Allgäu . . 481
Wiegand, Georg * Leipzig 408
Wiegandt & Grieben * Berlin 384
Wiegel, Albert * Kassel 401
Wiehr, Bruno * Dresden 406
Wiese, Professor M. * Hanau a. M. . . 430. 431
Wiesenbauschule Schleusingen 479
Wiesen- und Wegebauschule Siegen 479
Wiesinger-Florian, Olga * München 395
Wild, Joh. Ph. * Idar . 493
Wilhelm & Lind * München 444
Wilkens, M. H., & Söhne * Hermalingen 439. 455
Wille, Rudolf, & Fia * Berlin 455
Willmann, Rud. Bernard * München 395

Page

Willner, Reinhold * Berlin 451. 463
Willroider, Josef * München 395
Willrolder, Ludwig * München 395
Winckelmann, G. * Berlin 386
Winckelmann & Söhne * Berlin 384–386
Windisch, Prof. Dr. K. * Geisenheim a. Rh. . 373. 425
Windler, H. * Berlin . 376
Winhart, J., & Co. * München 444
Winkel, Karl * Göttingen 407
Winkelmann, M. * Berlin 407
Winkler, Prof. Dr. Clemens * Dresden . . . 365–367. 425
Winkler, Hermine * Stuttgart 456. 468
Winterhalter, Carl * München 439. 447
Wirnhier, Friedrich * München 395
Wirsing, Theodor * Schweinfurth a. M. . . 367. 425
Wirth, Anna Marie * München 395
Wirth, Emma * Stuttgart 433. 435
Wislicenus, Professor Dr. Hans * Tharandt in Sachsen 365. 366. 369. 373. 425
Wislicenus, Prof. Dr. Johannes * Tübingen . 369
Wislicenus, Professor Dr. Wilhelm * Tübingen 425
Witt, Prof. Dr. O. * Berlin 407
Witte, August * Aachen 439
Wittlich, Kreis 496
Wöhler, Dr. Lothar * Karlsruhe 367. 425
Woelbling * Berlin . . . 476
Wölfel, C. G. * Stuttgart 360. 456

Page

Wohl, Prof. Dr. * Charlottenburg-Berlin . . . 365. 367. 369. 370. 372. 425
Wohlfeldt, A. * Magdeburg 412. 451
Wolber, Professor Fritz * Pforzheim . . 444. 446
Wolf, Prof. Dr. Max * Heidelberg . . . 374. 415
Wolf, Louis, & Co. * Sonneberg 444
Wolf-Becker and Dr. Rudolf Lennhof * Berlin 501
Wolff, Otto * Berlin 374. 415
Wolff, Dr. E. and Prof. Dr. E. Fleischer * Reiboldsgrün i. Vogtl. . . 497
Wolff, F., & Sohn * Karlsruhe i. B. 426
Wolffenstein, Prof. Dr. * Charlottenburg . . . 365. 367. 371. 372. 425
Wolfs, J. L., Erben * Wachenheim (Rheinpfalz) 486
Wollenweber, Eduard * München 439. 447
Wollermann, Hellmuth * Braunschweig 384. 385
Wolleschak, Ed. * Naumburg a. S. 406
Wopfner, J. 506
Woywod, Max * Breslau 384
Wucherer, Fritz * Frankfurt a. M. 395
Wünsche, Emil * München 398
Wulff, E., & Hohmann * Berlin 416
Wunder, Gertrude * Jena 434
Wunderlich, Ernst * Leipzig 384
Wurzner Teppich- und Veloursfabriken * Wurzen (Sachsen) . . 449. 450. 463

Zacher, Dr. * Berlin . . 501
Zahn, Prof. Dr. * Berlin 501
Zausmer, A. * Danzig 432
Zeiss, C. * Berlin 379

Page

Zeiss, Carl * Jena 364. 369. 371. 373. 374. 376. 378. 380. 415. 425. 498. 500
Zeissig, Hans * Leipzig 450
Zentralausschuss zur Förderung der Volks- und Jugendspiele in Deutschland * Görlitz 387
Zentralkomitee für das Rettungswesen in Preussen * Berlin . . 416
Zeuch & Lausmann * Sonneberg 444
Ziegler, Emil * Frankfurt a. M. 457
Ziegler, Friedrich * Freiburg i. Br. 375
Ziegler, Karl * Berlin . 395
Ziegler, M. * Friedenau 480
Ziegler, Walter * München 396
Ziemens, Aug. M. Vincenz * Neustadt . . . 407
Ziesch, W., & Co. * Berlin 360. 463
Zimmermann, Ernst † * München 395
Zimmermann, Jul. Heinr. * Leipzig 411
Zimmermann, Josef, & Co. * München 444. 447. 448
Zimmermann & Buchloh * Berlin 473
Zinndorf, J. * Baumbach (Westerwald) 493
Zoologisches Institut der tierärztlichen Hochschule * München . . 374
Zoologisches Institut der Universität: Berlin . . 374
Heidelberg 374
Leipzig 374
Würzburg 374
v. Zschock, Gebr. * Strassburg-Neudorf . . . 454. 460
Zuber, J., & Co., K.-A.-G. * Rixheim (Oberelsass) 461
Zwarg, Jul. Otto * Freiburg i. S. 472
Zwernemann, H. * Hanau a. M. 431
Zwirner, L., Nachfolger * Lautenbach in Baden 479

List of Advertisements.

	Page
Emil Binder, Bijouteriefabrik * Pforzheim	21
Chemische Fabrik Hönningen, vormals Walther Feld & Co., Aktiengesellschaft * Hönningen a. Rh.	15
DaimlerMotoren-Gesellschaft*Cannstatt	4
Detmolder Stuckfabrik Alb. Lauermann * Detmold	8
Friedr. Dick, Feilen- und Fleischerstählefabrik * Esslingen a. N.	27
Georg Dralle, Parfümerien * Hamburg	5
Dreyer, Rosenkranz & Droop, Fabrik von Armaturen für Dampfkessel u. Maschinen, Wassermessern * Hannover	10
Eisenhütten- und Emaillierwerk (Besitzer W. von Krause, Berlin) * Neusalz a. d. Oder	16
Gasmotoren-Fabrik Deutz * Cöln-Deutz	23
J. Giesel & Co., Herstellung von giftfreien Farben * Dresden-Plauen	13
Alfred Gutmann, Aktienges. für Maschinenbau * Hamburg-Ottensen	12
Hamburg-Amerika-Linie, Post- und Schnelldampferdienst * Hamburg	32
J. A. Harth & Co., Weingrosshandlung * Mainz	27
H. Hauptner, Fabrik für Veterinärinstrumente * Berlin NW.	9
Joh. Heckemann, Speditionsgeschäft * Bremen	2
Henschel & Sohn, Lokomotivenfabrik, Maschinenbauanstalt und Kesselschmiede * Kassel	14
Rudolph Hertzog, Kaufhaus für Manufakturwaren * Berlin C.	31
Hildesheimer Sparherdfabrik A. Senking * Hildesheim	18
Hinckel & Winckler, Rhein- und Moselwein-Grosshandlung * Frankfurt am Main	15
Hoffmann, Heffter & Co., Grosshandlung für Rheingauer Weine * Leipzig und Eltville	6
Hübel & Denck, Kgl. Hofbuchbinderei * Leipzig	20
Ichthyol-Gesellschaft Cordes, Hermanni & Co. * Hamburg	24
G. Jörissen, Marmor * Oberlahnstein	21
Kast & Ehinger, G. m. b. H., Druckfarbenfabrik * Stuttgart	18
Kayserzinn * Cöln a. Rh.	3
Landauer & Macholl, Brennerei * Heilbronn	22
J. W. Lehmann, Maschinenfabrik * Dresden	12
Oskar Leuner, Fabrikation wissenschaftlicher und technischer Instrumente und Apparate * Dresden	30
C. Lorenz, Telephon- und Telegraphenwerke, Eisenbahn-Signalbauanstalt * Berlin SO.	19
Lübecker Maschinenbau-Gesellschaft * Lübeck	21
Lysoform, Ges. m. b. H. * Berlin	17
G. Merk, Kgl. Hofjuwelier, Inhaber Paul Merk * München	12
Mitteldeutsche Gummiwarenfabrik Louis Peter * Frankfurt a. M.	25
Nohn & Söhne, Weingrosshandlung * Waldhilbersheim bei Bingen a. Rh.	3
Patronenhülsenfabrik Bischweiler, Walbinger, Meuschel & Co. * Bischweiler im Elsass	7
Perkiewicz, Tonwerke Ludwigsberg bei Moschin	16
Carl Röder, Kgl. Hofmundbäcker * Dresden	29
Gebrüder Sachsenberg, Maschinenfabrik, Eisengiesserei u. Schiffswerft, G. m. b. H. * Rosslau i. Anhalt	26
Robert Schirmer, Bildhauerei * Berlin W.	30
Schüttekesselkonsortium * Bremerhaven	28
Otto Schultz, Tezett-Gitterwerk u. Kunstschmiede * Berlin SW.	1
Gabriel Sedlmayr, Brauerei zum Spaten * München	23
Sektkellerei J. Fromm, G. m. b. H. * Frankfurt a. M.	24
Stadtbrauerei Blankenhain in Thür., Akt.-Ges.	20
Paul Süss A.-G., Fabrikant für Gratulations- und Postkarten * Mügeln-Dresden	27
P. W. Franz Valckenberg, Weingrosshandlung in Rhein- und Moselweinen * Worms a. Rh.	23
Verlagsanstalt Alex. Koch * Darmstadt	11
E. C. Wachsmuth, Schulbilder- u. Kunstverlag * Leipzig	13
J. Wanschaff Sohn, Wissenschaftliche Instrumente * Berlin SO.	26
Weingut des Bürgerspitals zum heiligen Geist in Würzburg	8
Theodor Wirsing, Farben und Chemikalien * Schweinfurt a. M.	5
G. Wölfel, Marketerien u. Intarsien * Stuttgart	10
J. W. Zanders, Feinpapierfabrik * Bergisch-Gladbach bei Cöln a. Rh.	29

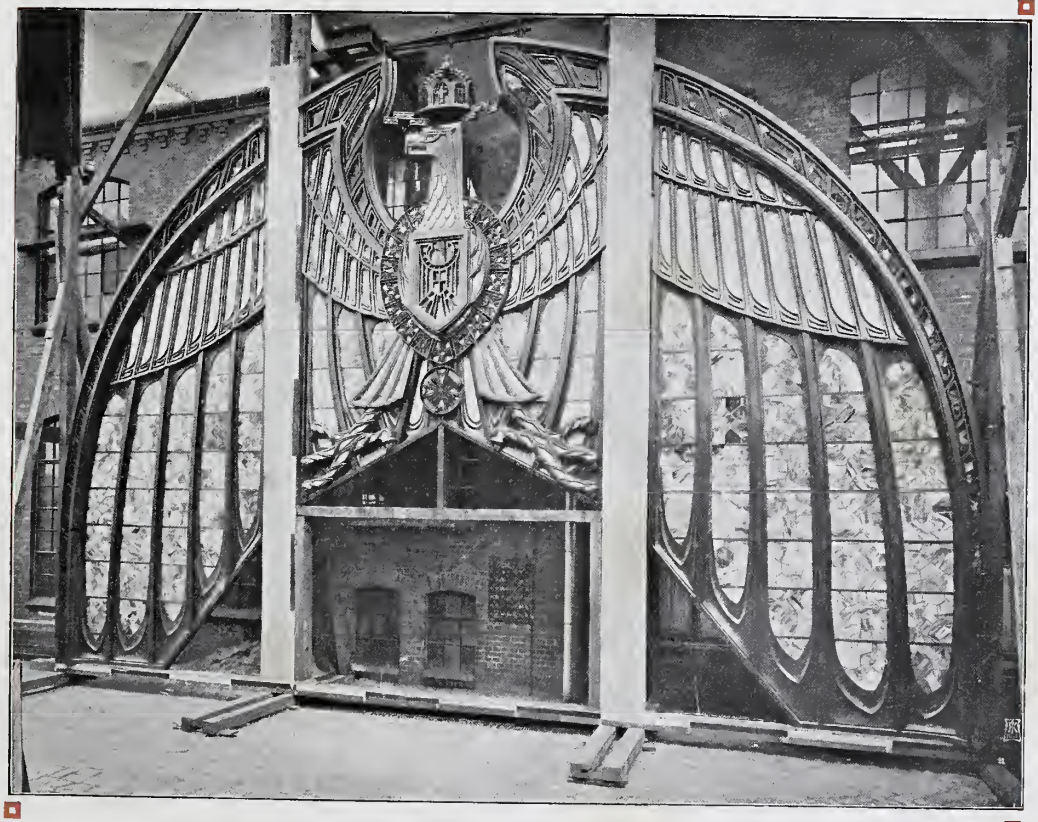
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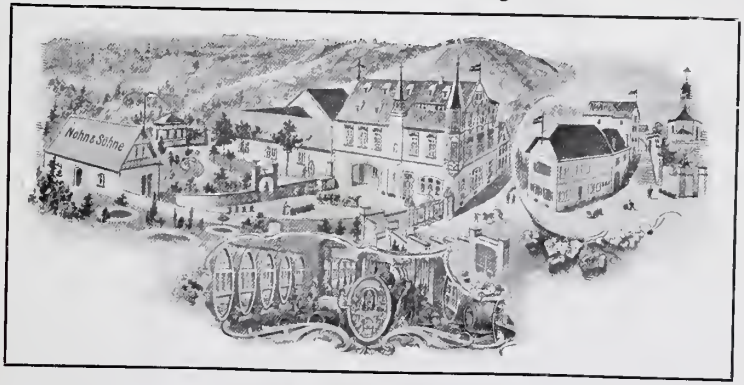
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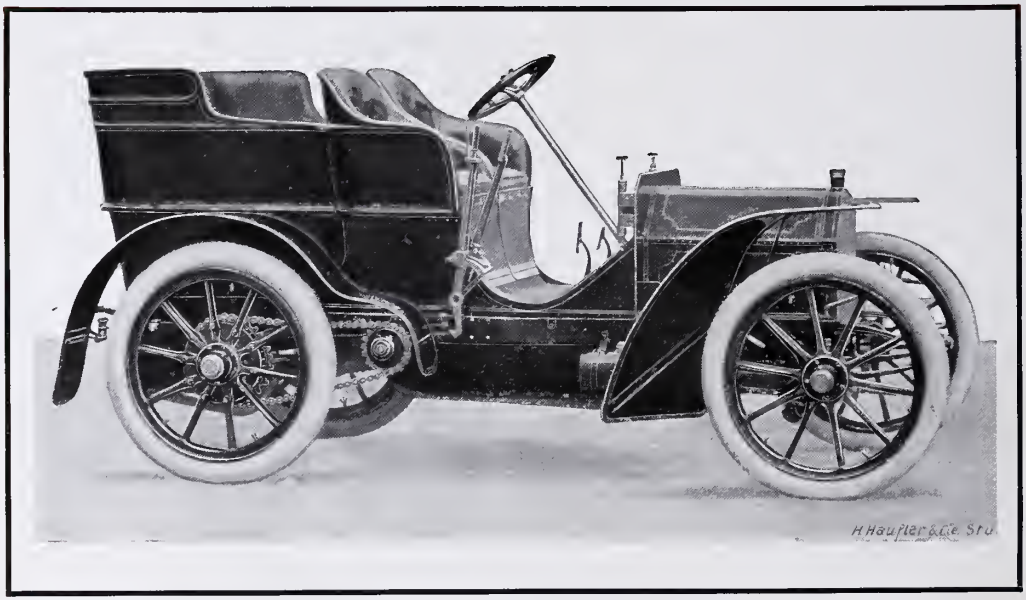
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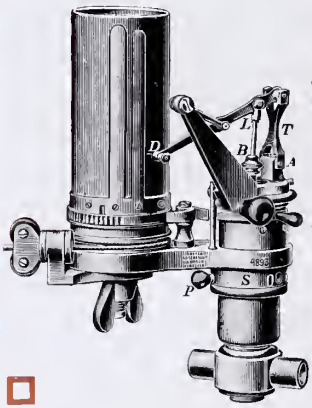
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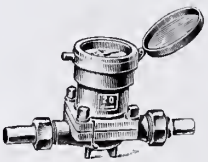
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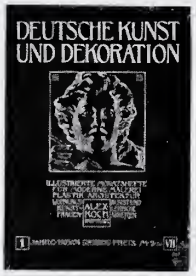


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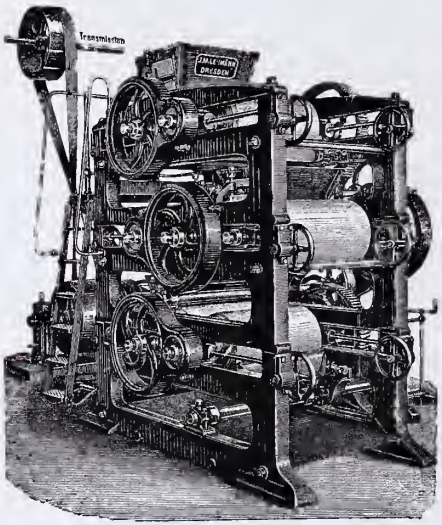
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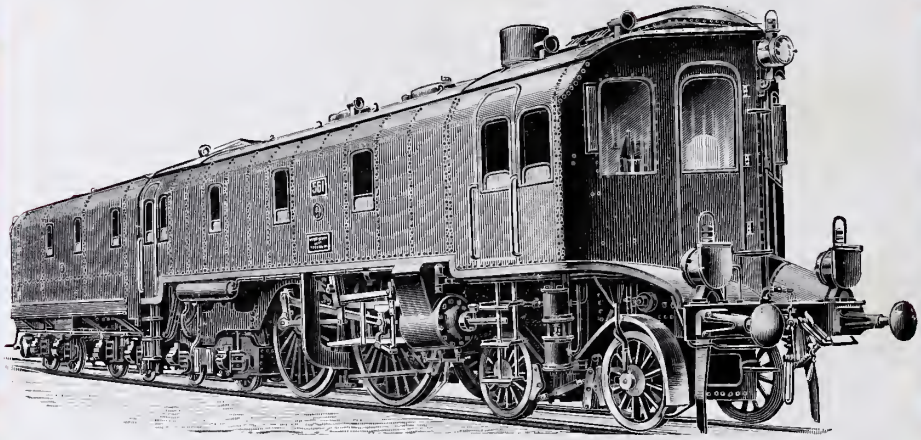
Wholesale House for the preparation of non-poisonous colours for articles of food and luxuries, the soap and fat industry.

Export to all parts of the World. Speciality: Export to all parts of the World.

Aromatic fruit Essences for the Manufacture of Sweets.

Total number manufactured about 6,900.

Average annual output 400–450 locomotives.



2/6 coupled four cylinder compound Express train locomotive (Speed, 150 kms. per hour).

HENSCHEL & SOHN

Established in 1817 — **CASSEL** — Established in 1817

The workshops of Henschel & Sohn, Cassel, the most important of their kind on the European continent, manufacture as specialities

Locomotives for main and branch lines, as well as for all kinds of small and street railways, mountain railways, for industrial works, earth works, plantations, &c. of every capacity.

Fireless locomotives, spare boilers and all supplementary parts for locomotives.

Machine Tools.

Nut presses for manufacturing six cornered nuts without any waste of material.

Steam machines, Boilers.

Own smelting-work: "Heinrichshütte" near Hattingen (Westphalia) with blast furnace for the production of iron and steel; own coke furnaces, puddling furnaces, rolling mills for rough plates, fine plates, bar and angle iron, steel mould castings, &c. Extensive subsidiary branches.

Own Coal mine in Westphalia.

HINCKEL & WINCKLER

FRANKFORT-ON-THE-MAIN

Founded in 1784

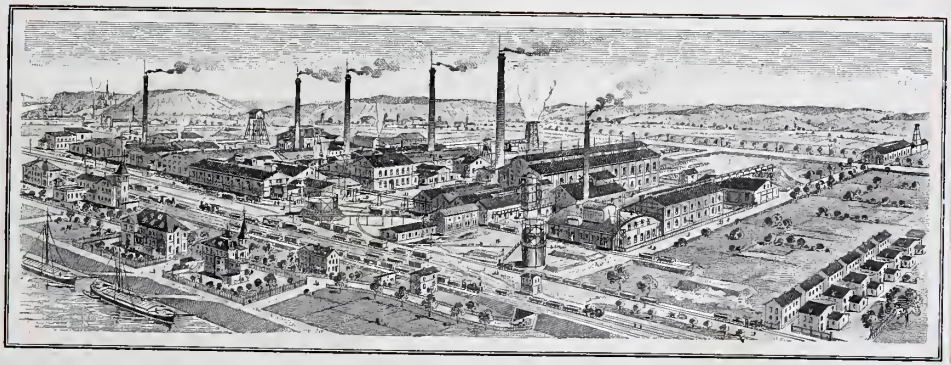
Founded in 1784

Shippers of Hocks and Moselles

Agents for the United States:

NEW YORK 27 South William Str. **C. H. ARNOLD & Co.** NEW YORK 27 South William Str.

Ask for our wines at the German Restaurant, World's Fair St. Louis.



The Hoenningen Chemical Factory

Established 1889.

formerly Messrs. Walther Feld & Co. Ltd.
Hoenningen on Rhine

300 workmen employed.

Telegr. Address: Chemische Hoenningenrhein. Bankers: Imperial Bank, Neuwied Branch.

Manufacturers of preparations of Baryta and Strontia.

Specialities: Carbonate of Baryta 96/99 %, Caustic Baryta 96/98 %, Crude Sulphur Barium 70/80 %, Barium oxide, Baric Chloride, Permanent white, Strontianite 94/95 %, Strontia Hydrate, Sulphuric Acid—free from arsenic or iron—especially for accumulators, Sulphate of Sodium, Hydrochloric acid—free from arsenic,—Nitric acid, compressed Carbonic acid.

The burning question in the Pottery Trade of the complete radical and cheap removal of Discolorations in Tiled goods without the use of Colouring matter is solved by

Perkiewicz's Process

patented in all civilised countries.

For permission to manufacture, or in order to acquire Patent rights please communicate with the

Ludwigsberg Clay Works,

near Moschin, Germany.

The firms exhibits are to the found in the German section of the Mines and Metallurgy Building.

Iron and Enamelling Works

(Proprietor W. von Krause, Berlin)

Neusalz-on-the-Oder, Germany.

Registered 

Trade-mark.

Cast Iron Goods of all kind

also enamelled, nickeled, coppered, brassed.

Articles for kitchen.
Meat-Cutters
for hand and for power.

Lemon-Sqeezers.
Meat-Presses.
Colour-Mills.

Closets, Pumps, Candlesticks, Lanterns.

Lysoform

Original House: "Lysoform," Co. Ltd., Berlin.

Branches: Paris, London, St. Petersburg, Mailand.



Trade Mark

German Patents No. 141,744 and 145,390. American Patent No. 740,424. Exhibited in the German Education Department by permission of the Royal Prussian Ministry of Culture.

Lysoform

is a Formaline preparation, disinfecting and deodorising without the dangerous bye-workings of creosote and carbolic preparations; safest possible disinfection without smell. Introduced into the first State Hospitals of Germany.

Raw-Lysoform

is a Disinfectant and Deodorant for purposes of wholesale Disinfection. For the disinfecting and deodorising of sick-rooms, cabins, railway compartments, offices, factories and school rooms, lavatories and closets; disinfects cheaply, quickly and reliably, removes bad smells effectually and has an eximently purifying action without harming the objects, disinfected.

Lysoform Toilet Soap

is a novelty in the domain of medicinal soaps and combines a disinfecting action with the properties of a first class toilet soap.

KAST & EHINGER G.m.b.H.

STUTTGART

Printing ink manufacturers

Many awards. Paris 1900: Grand Prix.

New York branch: CHAS. HELLMUTH 46—48 E. Houston St.

Trade Mark

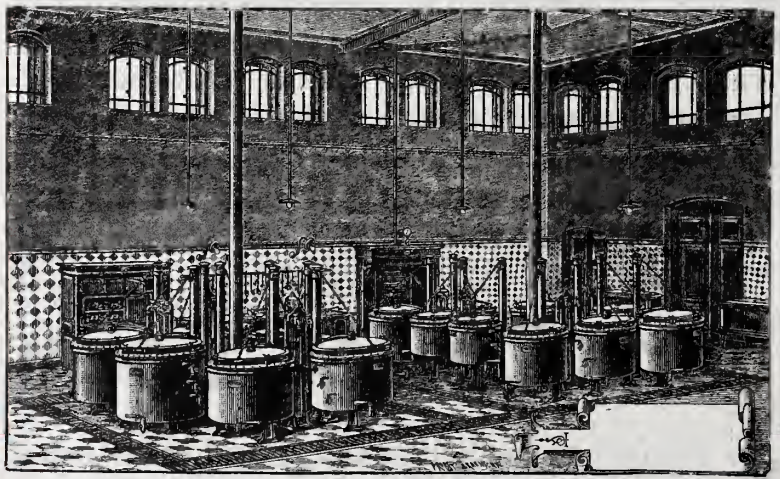
Chicago branch: CHAS. HELLMUTH 357—359 S. Clark St.

Inks and colors for the entire Graphical trade: letterpress-, litho-, collotype-, copper-plate-, tin-plate-printing, Bookbinder work, &c. Varnishes. Roller Composition. Autographic black. Autographic ink. Lessive for types. Lithographic ink in sticks. Lithographic crayon.

Hildesheim Economical Kitchen Range Factory

A. Senking, Hildesheim

First Special Factory in Germany of cooking apparatuses for wholesale provisioning in Barracks, Hospitals, Infirmaries, Soup-Kitchens, for Establishments with the greatest requirements, for Heating with solid fuel-coal, wood, &c.-as also with gas or steam.



Kitchen of the Municipal Lunatic Asylum at Herzberge, near Berlin.

Cooking, roasting, baking and warming apparatuses for households, gentlement's kitchens, restaurants, hotels, steamships, etc,.

Admitted to be the best manufacturers.

Exhibit: Apparatuses for the Kitchen of the German State Building.



Telephone Apparatuses for House, City and Long Distance use.

Central Switches for small or large Telephone networks of all systems.

Telegraph Apparatuses for Post office, Railway, Police and Military.

Railway Signals for all purposes, Ringing Apparatus, Track-warners, Rail contacts.

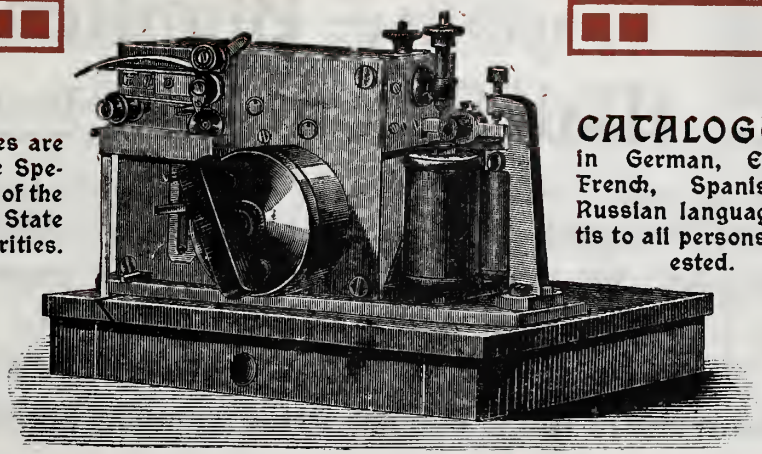


C. LORENZ

Telephone and Telegraph Works

Railway Signal Construction Establishment

Founded 1880 **Berlin SO. 26** Founded 1880



My manufactures are exhibited at the Special Show stand of the Royal Prussian State Railway Authorities.

CATALOGUES in German, English, French, Spanish or Russian language gratis to all persons interested.

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of every kind.

Our speciality: Artistic bindings for catalogues, price-lists, &c.

The binding of this official catalogue shows the quality of our work.

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Blankenhain in Thuringia.



Trade-mark.

Speciality: **Blankenhain Malt Strong Ale.** Pasteurised.

Recommended by doctors as a dietetic and strengthening means for persons suffering from lung, heart and stomachical complaints, for weakness, consumptive and anæmic people, convalescents and wet nurses.

Contains most malt! Infinitesimal amount of alcohol!

Prizes awarded 1903: Vienna, Paris, London, highest awards.

EMIL BINDER, Pforzheim

Bijouteriefabrik

Spezialitäten:
Emailbijouterie, Medaillen, Anhänger, Gürtelschnallen, Broschen, Manschettenknöpfe, Zigarettenetuis, Feuerzeuge, Zigarrenabschneider, Messer, Papiermesser, Saisonartikel.

Manufacturer of Jewellery

Specialities:
Enammelled jewellery, medals, pendants, buckles, brooches, sleeve-links, cigarette-cases, match-boxes, cigar-cutters, knives, paper-knives, souvenirs.

Fabrique de Bijouterie

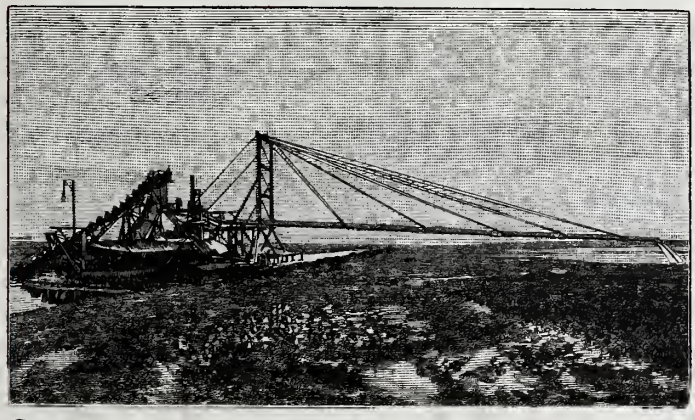
Spécialités:
Bijouterieémaillée, Amulettes, Breloques, Boucles à ceinture, Broches, Boutons de manchette, Porte-cigarettes, Porte-allumettes, Coupe-cigares, Canifs, Coupe-papier, Articles de saison (souvenirs).

Several registered Designs and Patents.

Lübecker Maschinenbau-Gesellschaft

Lübeck

machine-works, pig-iron and chilled iron-foundry, boiler-forge.



Speciality:

Dredgers

of every construction, capacity and dredging depth, Sea-, Canal- and Harbour-work, for gravel-, peat-, ore-digging, &c. Elevators, flushing apparatus, hopper barges, diving-bell plants, floating-docks.

Excavators of every construction, capacity and dredging-depth, for Canal-, Harbour- and railway-work, open earth-work in mining and brick-kilns for chalk-, clay- and gold-digging driven by steam or electricity.

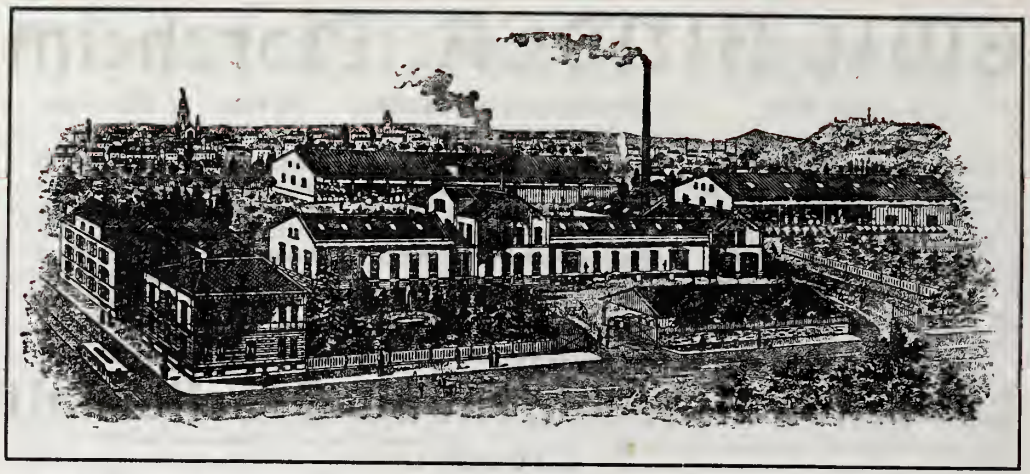
The two massive porches and the covering of the walls in the vestibule of the Artistic Trade Building, designed by Mr. BRUNO MÖHRING, Architect are of special

Interest to the Building Trade.

The marble was supplied by **Messrs. G. Jörissen of Oberlahnstein,**

whose quarries yield Porvenir, Estrellante and Rojizonazo, which are easily worked and generally appreciated for their beautiful colouring. Unattained size and perfection of blocks in coloured marble.

The marble Quarrying and Importing Company in New York City and Albany N. Y. has undertaken the United States Agency.



LANDAUER & MACHOLL

Established 1860 — HEILBRONN — Established 1860

10 Prize Medals
Awarded
Philadelphia Exhib. 1876

TRADE MARK

Gold Medal
Frankfort on the Main 1900
World's Fair—Paris 1900



Distillery

of "Kirschwasser"
"Zwetschgenwasser"
"Raspberry Liqueur"
Cherry Brandy
Cinnamon, Cordials



Gabriel Sedlmayr, Brauerei zum Spaten, Munich



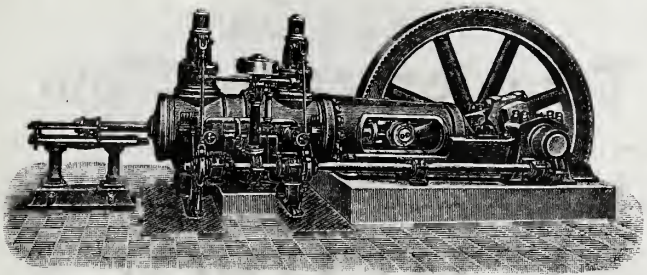
Capacity about 430,000 barrels yearly (upwards of 500,000 hectoliter). Highest awards at all the Exhibitions in which he took part. Great export to all parts of the world.

DEUTZ Gas-motor Factory

COLOGNE-DEUTZ

Working capital 20,000,000 marks

Double-acting four-time motor



Double-acting four-time motor

Specialities: Original Otto motors in all sizes from 1 to 6,000 h.p., double acting four-time blast furnace-gas-motors, pressure and suction-generator-gas plant for the production of motor gas from anthracite, bituminous coal, brown coal, peat, wood, clarified mud, &c. (fuel utilisation double as much as in steam engines). Complete Pumping and Water Works Plant with Motor power. Motor locomotives for mines, field and street railways, motor traction engines, motor-boats for conveyance of passengers and goods, canal boats.



Trade-mark registered

P. W. Franz Valckenberg

Have no agents! **Worms on Rhine.** Have no agents!

Grower and Dealer with Renish and Moselle Wines — Owner of Liebfraumilch Vineyards (1st class) — Sole Proprietor of Liebfraumilch Kirchenschlüssel (opposite the Church).

Cable address: "Seniorsohn" Worms. Postal box: No. 20.

Four registered trading-marks for the words: "Tischwein" (at table), "Valckenberg" (the name itself) for Still and Sparkling, "Liebfraumilch Kirchenschlüssel" and "the general Trade-mark" (see above).

"Tischwein" is a Specialty.

Only one Price.

CHAMPAGNE

FROMM

Only one quality.

Trocken. Sec. | Halbtrocken. Demi sec. | Süss. Doux.

Equal to the best French wines. Manufactured from the best wines of the Champagne, without the addition of any other wines.

Champagne Cellars of J. FROMM, Limited.

Telephone 2326.

Darmstädter Landstr. 250. **Frankfort-on-the-Main** Darmstädter Landstr. 250.

Reliable Sulphur Preparation.

ICHTHYOL

Reliable Sulphur Preparation.

Used with success for diseases of the skin, of the organs of digestion and circulation, for gonorrhoea, for rheumatism, for female complaints, as well as for Chlorosis and Tuberculosis of the lungs.

Registered in all civilised countries.

Sole Manufacturers:

Cordes Hermanni & Co., Ichthyol Company, Hamburg.

Representives for the United States of North America and Canada: Merck & Co., New York.

Beware of Imitations!

THE PETER UNION PNEUMATIC TIRE Co

Telegraphic Address: Gummipeter

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Telephone No. 695

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Head Office and Works: Mainzer Landstrasse 186

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Peter Union Pneumatic Tires for Cycles and Autocars

Peter Double Patent Rim for all kind of Wheels and Tires

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Peter Puncture Proof Bands for Air Tubes

India Rubber Goods for Technical Purposes

Represented by Mr. Richard Bockemühl.

J. WANSCHAFF SOHN

Established 1876.

Scientific Instruments.

Established 1876.

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Specialities:

All Instruments that require exactest circular and linear divisions such as: Refracting Telescopes (Sweden). Meridian Circles (Swiss Observat., Zurich). Tachymeters, Micrometers, Theodolites for Triangulations, &c. (Royal Prussian Surveying Office, Governments of Denmark, the Netherlands, Russia, Sweden and America). Prismatic reflectors, Eccentricity-free Sextants (Imp. Germ., Imp. Russ. Navies, &c.). 1st cl. Spectrometers (Royal Phys. and Techn. Instit., and several private institutes). Goniometers, Photometers (Royal Geod. Instit., Potsdam). Altitude Telescopes (Royal Geod. Instit. for Internat. Land Surveying, Potsdam. Observat. in Italy, Japan, the Netherlands, Russia and America). Magnetic Theodolites and Recording Apparatus of every kind (Magnet. Observat. Potsdam, many Ming. Observat.). Longitudin. measuring instrum. of all kinds. Equipments for expeditions. Accuracy of division of circle 0·3"–0·4" (mean error of division).

Tropical Instruments (without steel).

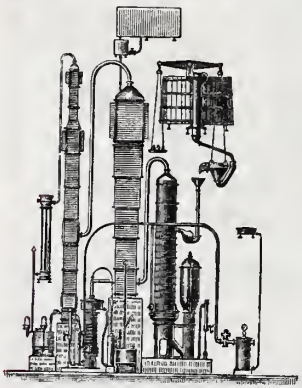
Paris 1900: Great Prize.

Modern Constructions of every kind.

Melbourne, Chicago: Gold Medals.

Illustrated Catalogues as well as pamphlets about the examination of my filing on the Meridian Circle of the Zurich Observatory, in German, English and French, to be obtained gratis from the representative of the Scientific Instruments group and from the firm direct.

GEBRÜDER SACHSENBERG



Established 1844. Limited. About 1 000 workmen employed.

Engineering Works, Iron foundry, Ship-building Yard.

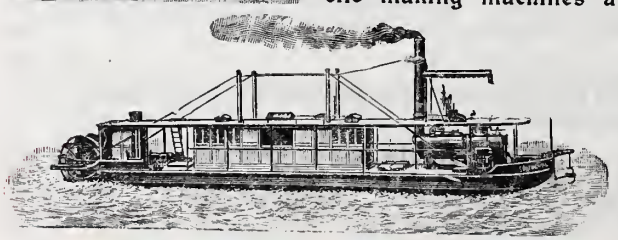
Rosslau in Anhalt

Branch Establishment. **Cologne-Deutz**

Telegraphic Codes: Staudt & Hundius, A. B. C. code.

Telegraphic Address: Sachsenberg-Rosslauanhalt.

All varieties of the "Robert Ilges" patent Distilling and Redistillation Apparatuses with continuous automatic working. The most modern construction of the latter yields direct from the wash 90 per cent of the whole Alcohol as purest first-class spirit, likewise distills raw spirit advantageously. Complete Distillery Plant, mash-vats, mash-tub apparatus. Registered Trademark 205,388. Henze-dampers, malt-mills, &c. Tile making machines and Compression machines, yeast works, malt houses. Steam-engines and boilers of every kind and size. Paddle and screw steamboats, Stern-wheel steamers. Dredges. Suction-dredgers, Drying dredgers, Dutch barges, Bongos, Floating cranes, &c., whole or in parts.



Drawings of tugs and suction-dredgers exhibited (see group 26).

PAUL SÜSS A.G.
MÜGELN-DRESDEN.
MANUFACTURERS OF CHRISTMAS NEW-YEAR, and POSTCARDS.

First firm in the line,
about 500 Workpeople employed.
Export to all parts of the world.
Prizes awarded at Melbourne and Leipsic.
Represented at the St. Louis Exhibition.
German Department. Liberal Arts.

PAUL SÜSS A.G.
MÜGELN-DRESDEN.
MANUFACTURERS OF CHRISTMAS NEW-YEAR, and POSTCARDS.

J. A. HARTH & Co.

Established 1848 **MAYENCE** Established 1848

Wholesale Wine Dealer.

Speciality: Rhinegau and Rhenish Hessian Wines.

Only the Trade supplied.

"Dick"-Files,

large and small for Engine-works with or without undulating-cut. Precision-files for Watchmakers, Jewellers, Engravers, Engineers, Dentists, &c. Tools for Electro-technic and Automobile-works. Patent-cut Rasps, Saw-blades, &c.

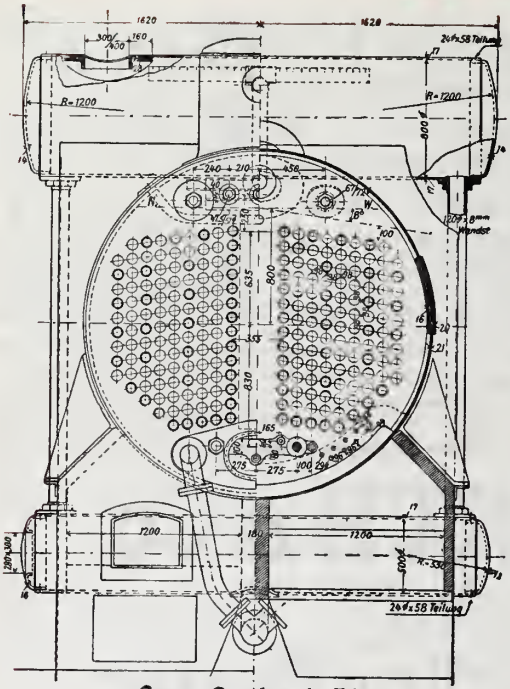
Trade-marks: F. → D. F. D.

"Dick"-Butcher Steels,

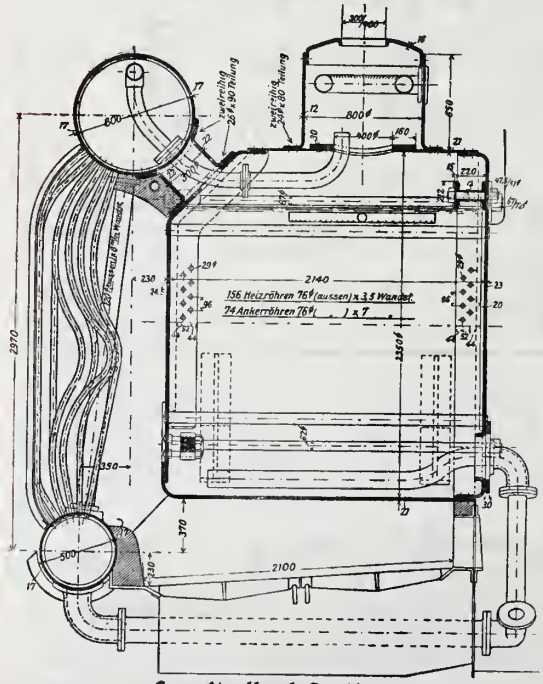
Knives, Cleavers, Carving-sets, &c. with the registered Trade-mark: → F. DICK

Friedr. Dick, Esslingen o/n., Germany

Sole Agency for the U. S. A.: John Chatillon & Sons, 85-93 Cliff Street, New York.
450 Workmen. 300 Horse-power. 50 Medals and Diplomas. Write for Catalogue.



Cross Section 1:50.



Longitudinal Section.

The "Schütte" type of Steam Boiler

forms a combination of cylindrical fire tube boilers with return flames and of narrow tube water tube boilers. It combines the advantages of both types whilst eliminating as far as possible the drawbacks of both types. The oval shape of the fire tube boiler originally chosen, such as has been made for the Exposition at St. Louis by the Engine building Factory "Vulcan" of Stettin, has been abandoned, in order to avoid firstly the anchoring and the perforated stays which are exposed to the greatest heat and secondly the steam dome the hoop of which is rather difficult to manufacture. The new shape is illustrated in the Transport Exhibition by a steam launch boiler constructed by C. Seebeck & Co. Ltd., of Bremerhaven. A similar boiler has been used with the greatest success for over a year by the Norddeutschen Ocean Cable Works Co. Ltd., Nordenham-on-the-Weser. The new boilers of the steamyacht "Lensahn" built for His Royal Highness the Grandduke of Oldenburg, are almost similar ones, only larger, each possessing a heating surface of 170 sq.-ms. A boiler of this description weighs when ready for use, including armatures, casing, grates, water, &c., 28,000 kgs, or 165 kgs to every square-metre of heating surface as compared with 300 kgs of an ordinary cylindrical marine boiler. In addition to this saving in weight of about 45 per cent, the following advantages are generally recognised: the excellent circulation of water in the boiler, easy feeding and cleaning, the rapid development of steam, the small consumption of coal and the modern simple construction. The German patents have been purchased by G. Seebeck & Co. Ltd., Bremerhaven, whilst all the foreign patents are in the hands of the Schütte Boiler Syndicate, which is represented at the Exposition. The American patents are for sale.

Schütte Boiler Syndicate.

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Largest Maker of Fine and Superfine Papers in Germany

Bergisch-Gladbach near Cologne on Rhine.

Specialities:

Ivory Boards, Drawing Papers, Blottings, Banks, Art Papers, Account Book Papers, Handmade Drawing Papers and Loans.

The papers in this Catalogue are the make of J. W. ZANDERS.

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Court-baker to the King of Saxony and Purveyor to the King of Wuerttemberg

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Special Export business for Dresden Christmas Cakes, Biscuits and finest Paris Chocolate Cakes

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Prize awarded



Hanover 1898

Gold Medal



Hamburg 1898

Oskar Leuner
DRESDEN





Numerous awards

Established 1870. Connected with the K. S. Technical High School since 1876.

Office: Klarastr. 16.





Numerous awards

Construction and Manufacture of technical Instruments and Apparatuses.

Gas analysis apparatuses according to Geheimrat Professor Dr. W. Hempel, Dresden; See methods of Gas analysis by Dr. W. Hempel; Translated from the third German Edition and considerably enlarged by L. M. Dennis, Professor of analytical and anorganic Chemistry at Cornell University. Toepler's Universal apparatus for mechanical demonstrations. Statical induction machines, unaffected by atmospheric moisture, with 2 to 60 rotating dises. Instruments for testing iron bridges: Tension, flection and horizontal oscillation indicators, wire drawing apparatuses, instruments for hydraulic engineering: indicators for channels of rivers, cross section and water tachometers (German Patent). Registring tearing apparatuses and machines for the investigation of paper, spun and woven goods, leather, &c. Traction indicators, crank power indicator, Kinematic and machine instructional models, casting up machines registering single items and totals immediately and visibly. German Patent applied for.

ROBERT SCHIRMER

BERLIN W. 50, Schaperstr. 32. Telephone IX, 5021.
WILMERSDORF, Berliner Str. 163–164.

Dept. 1. Sculpture Preparation of models for execution in any material. Plastered Stucco. Carved wooden work.

Dept. 2. Fireproof Wire-plastering and Cement Construction Drawn and polished work in Plaster and Marble-cement. Marble-stucco.

Dept. 3. Small Models of Architecture
Plans of factories, &c., white or coloured. Pictorial-plastic Dioramas.

Exhibitions: Berlin Industrial Exhibition 1896. Paris Exhibition 1900. International Fire Protection Exhibition Berlin 1901. Düsseldorf Industrial Exhibition 1902. Great Berlin Art Exhibition 1903 (large reception hall). Exhibition of the Royal Academy of Arts Unter den Linden 8. 1902.

References: Works executed for Prof. Bruno Schmitz, Prof. Karl Hoffacker (Art Institution Berlin, &c.), Works Commissioners Kayser and von Grossheim, Kieschke, Schulze, &c.

RUDOLPH HERTZOG

Germany's most important Drapery and Furnishing Stores

12-18 Breite Strasse
24-33 Brüderstrasse

Berlin C.

Germany

12-18 Breite Strasse
24-33 Brüderstrasse

Founded 1839.

Gold State-Medal



Berlin 1896

Founded 1839.

Dress fabrics of every description. Under-linen. Household-linen. Woollen Hosiery and Underclothing. Sport-Dresses. Ladies', Gentlemen's and Children's Outfits. Gloves. Cravats. Umbrellas. Travelling-Outfits. Curtains. Furniture. Carpets and Rugs. Bedsteads.

Ateliers for home-decoration and upholstery, manufactory of flags and banners

International Exposition St. Louis 1904:

German House: Curtains and hangings (see p. 359. 463).
Before the German House: Embroidered banners (see p. 362. 463).
Building of German Arts: Oriental Carpets (see p. 462).
Varied Industr.-Build.: Children's sleep.-room, Linoleum, Carpets (see p. 455. 458).
Liberal Arts-Building: Embroidered robes (G. A. Jahn, Plauen) (see p. 468).

MXXV 6/89

Hamburg-America Line

Direct Service of German Mail and Fast Steamships



Hamburg-New York	Hamburg-New Orleans	Hamburg-Brazil	NewYork-West Indies
Hamburg-France	Hamburg-Venezuela	Hamburg-La Plata	New York-Central America
Hamburg-Belgium	Hamburg-Columbia	Hamburg-East Asia	Orient voyages
Hamburg-England	Hamburg-Central-America	Genoa-La Plata	Arctic voyages
Hamburg-Baltimore	Hamburg-West Indies	Stettin-New York	Voyages round the world
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further by the steamships of the German East Africa Line: Hamburg-East and South Africa and conjointly with the Hamburg South American Steamship Co. to Brazil, Argentina, Uruguay.

Hamburg-New York, Fast Steamship Service.

Further details to be had from

The Hamburg-America-Line, Passenger-Department, **Hamburg,**

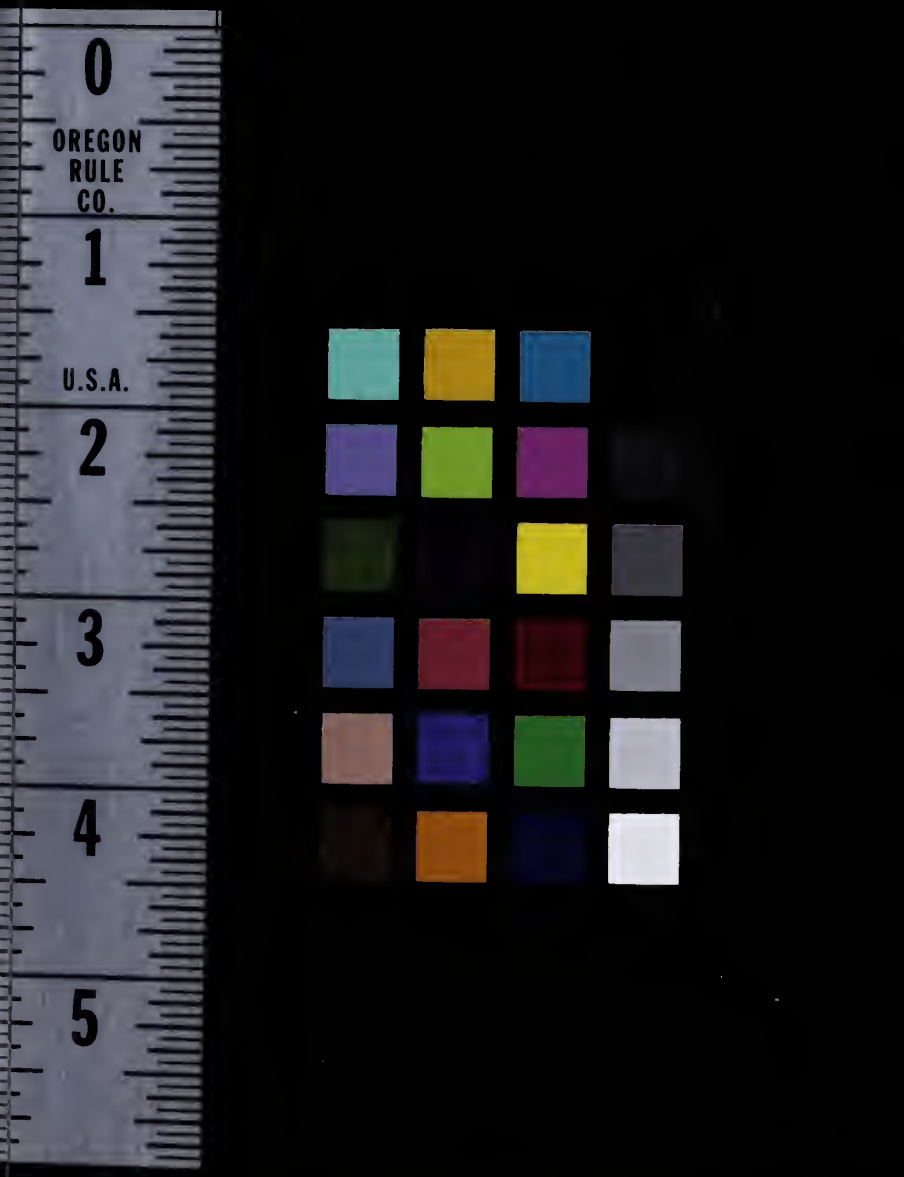
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